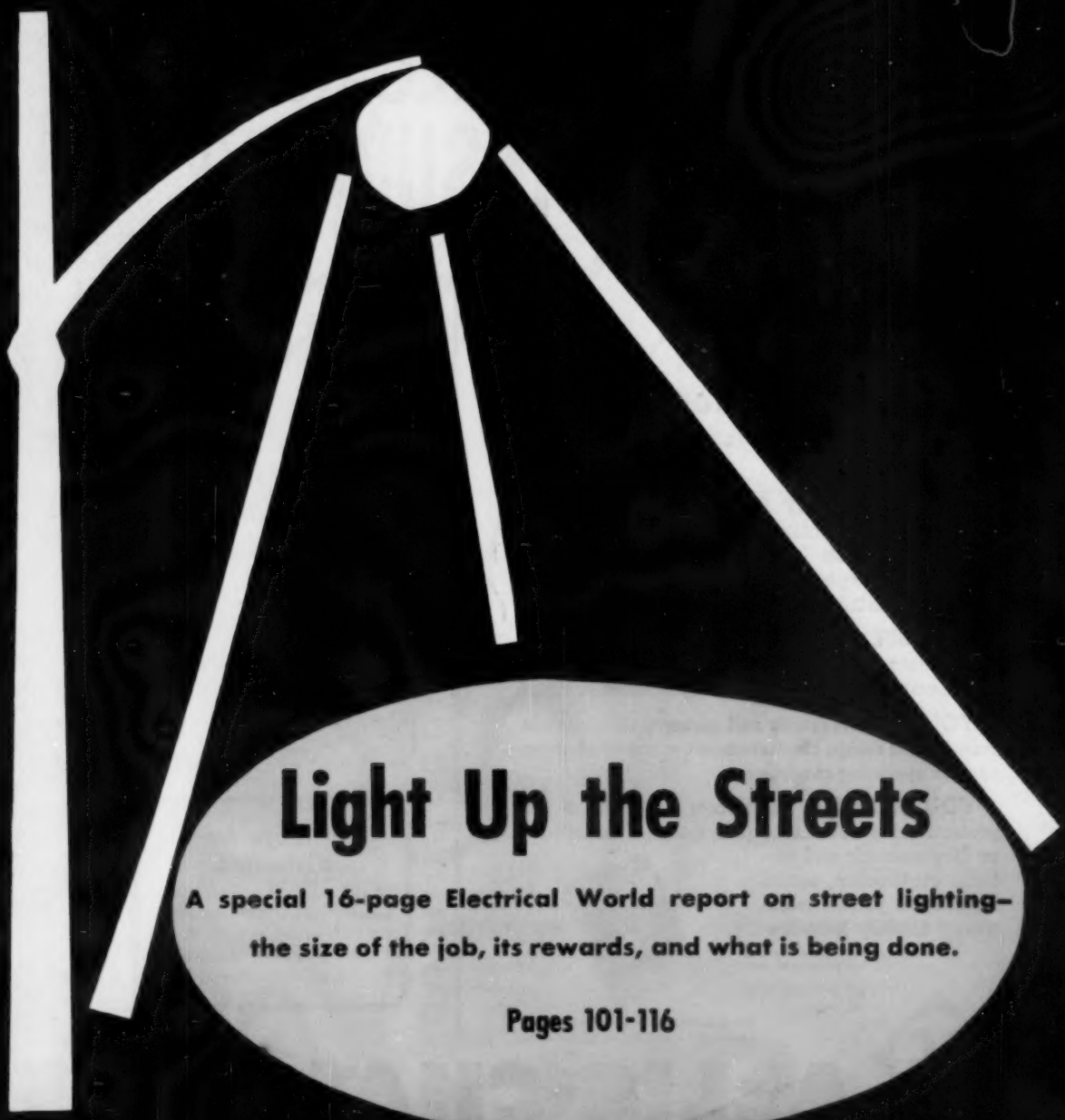
OCTOBER 3, 1955

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



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A special 16-page Electrical World report on street lighting—the size of the job, its rewards, and what is being done.

Pages 101-116

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Allis-Chalmers New 20-Minute Color Sound Slidefilm Tells Story of Distribution Transformer Protection

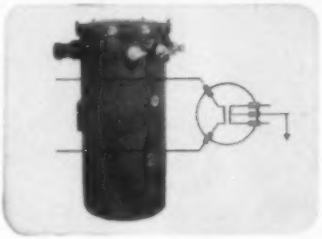
Prepared for Utility training groups and engineering students, Allis-Chalmers new color slidefilm "Kilowatt Insurance" provides a convenient, graphic explanation of the use of protective devices on distribution transformers.

YOU SEE an explanation of the basic theory of transformer operating conditions — what problems are caused by lightning, overload and short circuits.

YOU SEE diagrams and pictures that explain transformer design characteristics which meet these various operating conditions.

YOU SEE solutions to these problems in the protective devices used on utility systems. In addition to diagrammatic and pictorial explanation, actual installation photos relate theory to daily practice.

Story is told in booklet form too — copies are available at all showings.



Arrange for a showing

of this new film. Call your nearby Allis-Chalmers office for information or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

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Electrical World

Published for 81 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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This advertisement reproduced the results of tests made on an Okonite-Callender paper-insulated cable in 1949.

The advertisement reproduced here appeared five years ago. The story it told then remains true today—that is, that the first length of lead-sheathed cable furnished with an Okosheath Protective Covering back in 1933 is still operating successfully in a highly corrosive location. Since then, many hundreds of thousands of feet of cable protected by Okosheath Protective Covering have been installed, AND WE HAVE YET TO RECEIVE A REPORT THAT A SINGLE LENGTH HAS FAILED BECAUSE OF CORROSION.

Today over half the lead-sheathed paper cables supplied by Okonite have Okosheath Protective Coverings specified by the user—not only to protect against corrosion and electrolysis, but to reduce the danger of sheath scoring during installation.

When the Okosheath Protective Covering is used in combination with an Okometal alloyed sheath, the composite construction permits a reduction in the thickness of metal required, and a corresponding saving in cost. Wherever a paper power cable is required, the advantages of Okonite's composite sheath should be considered. Detailed information may be obtained by writing for Bulletin EW-1047. The Okonite Company, Passaic, N. J.

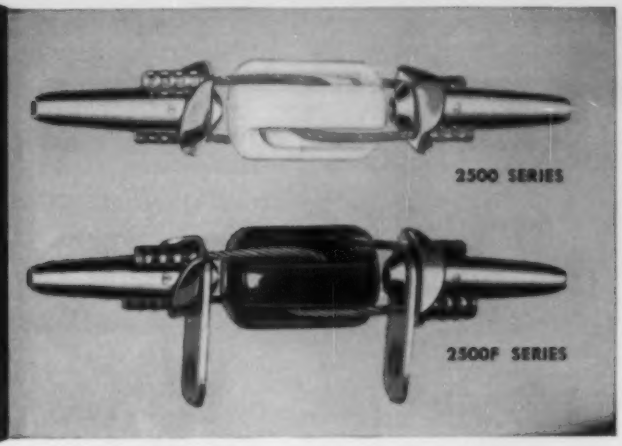
1859-A

OKONITE SINCE 1878 *insulated cables*

for the largest number of line applications at the lowest possible cost...

USE *Electroline*

Insulating Automatic Line Splice SECTIONALIZERS



The Electroline Sectionalizers are assemblies that will function in service as most convenient, reliable and yet low cost interrupting devices. Series 2500-F and 2600 provide for paralleling with a fuse element for further protection when sectionalizing. The mechanical strength of these assemblies exceeds in all cases the rated breaking strength of the conductor for which they are adapted.

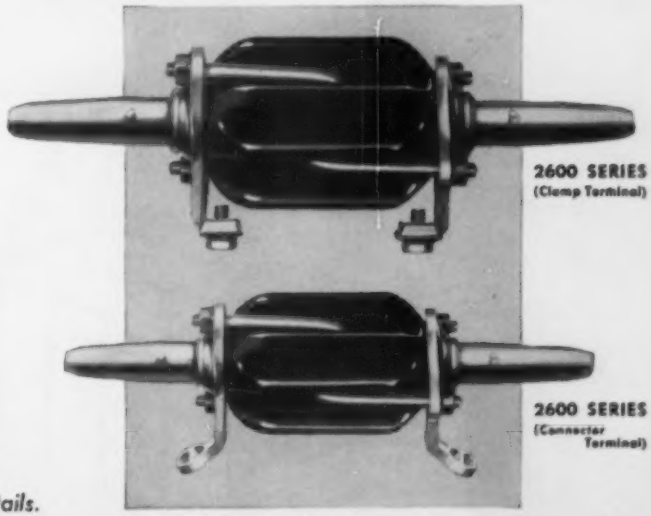
These Insulating Automatic Line Splice Sectionalizers are ideal for:

Installing Regulating Equipment,
simplifies cutting-in disconnecting points, fuses, voltage regulators and series capacitors;

Restoring Service,
providing points to test for trouble;

Sectionalizing Networks,
to readily isolate and test the area in trouble;

Series Street Lighting,
simplifies cutting-in series street lamps—merely cut the line and insert conductor ends into sectionalizer.



Send for Bulletins containing complete details.

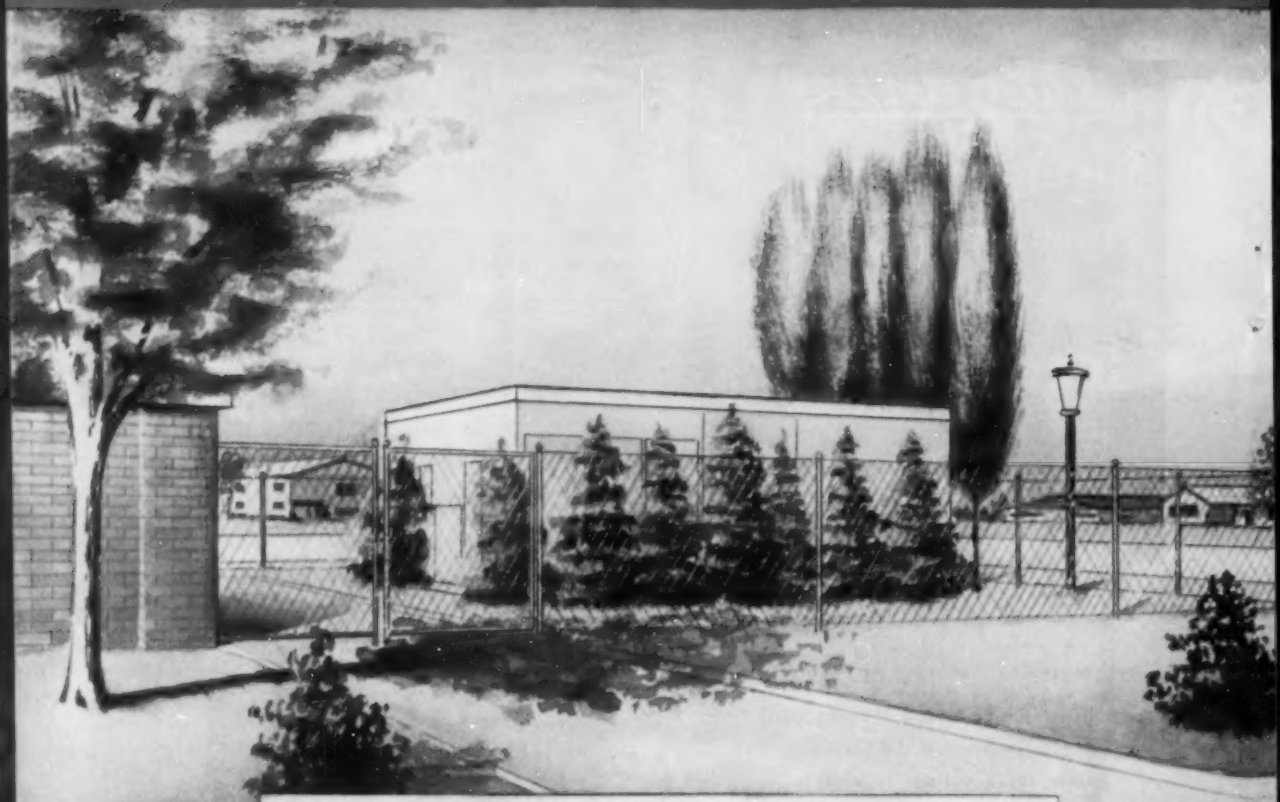
TALENT TO originate E ABILITY TO produce

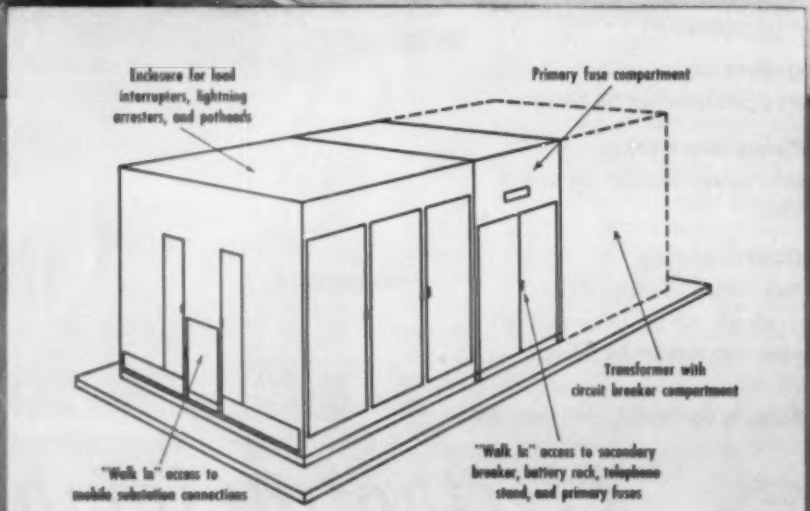
Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

WILL YOUR NEW DISTRIBUTION SUBSTATION

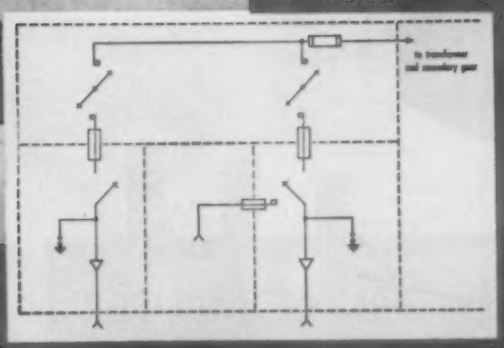



Enclosure for load interrupters, lightning arresters, and pothead
Primary fuse compartment
Transformer with circuit breaker compartment
"Walk in" access to secondary breaker, battery rack, telephone stand, and primary fuses
"Walk in" access to mobile substation connections

HAVE Neighborhood Acceptance?

WILL IT GIVE YOU ZONING BOARD APPROVAL?

With S&C Metalclad Primary Gear you get a compact, attractive, and *Completely* Enclosed Substation for residential areas—even when the primary service is 34.5 kv



Circuit diagram of the S&C Metalclad Primary Gear for the distribution substation illustrated. The gear is equipped with Type SM Power Fuses and Alduti Type Load Interrupters with provision for remote control operation.

Plus THESE EXTRA ADVANTAGES

- Tamper-free metalclad construction: High voltage is locked in . . . intruders are kept out—and safe
- Simple, *packaged* installation that saves the time and cost of piecemeal open construction
- *Reliable protection* and ability to switch under all conditions, except short circuit
- New conveniences in operating and maintenance

Incorporated in the unit on the left are these operating features:

1) Pothead isolation—for protection of operators during maintenance

2) Disconnecting provisions to isolate load interrupters, to by-pass entire substation, and to feed mobile substation

3) Integral housing of control panels, battery rack, work stand, telephone stand. Elimination of need for unsightly tool shacks

4) Shelter for maintenance of secondary gear

5) Unit capsuled for shipment in one piece

S&C ELECTRIC COMPANY

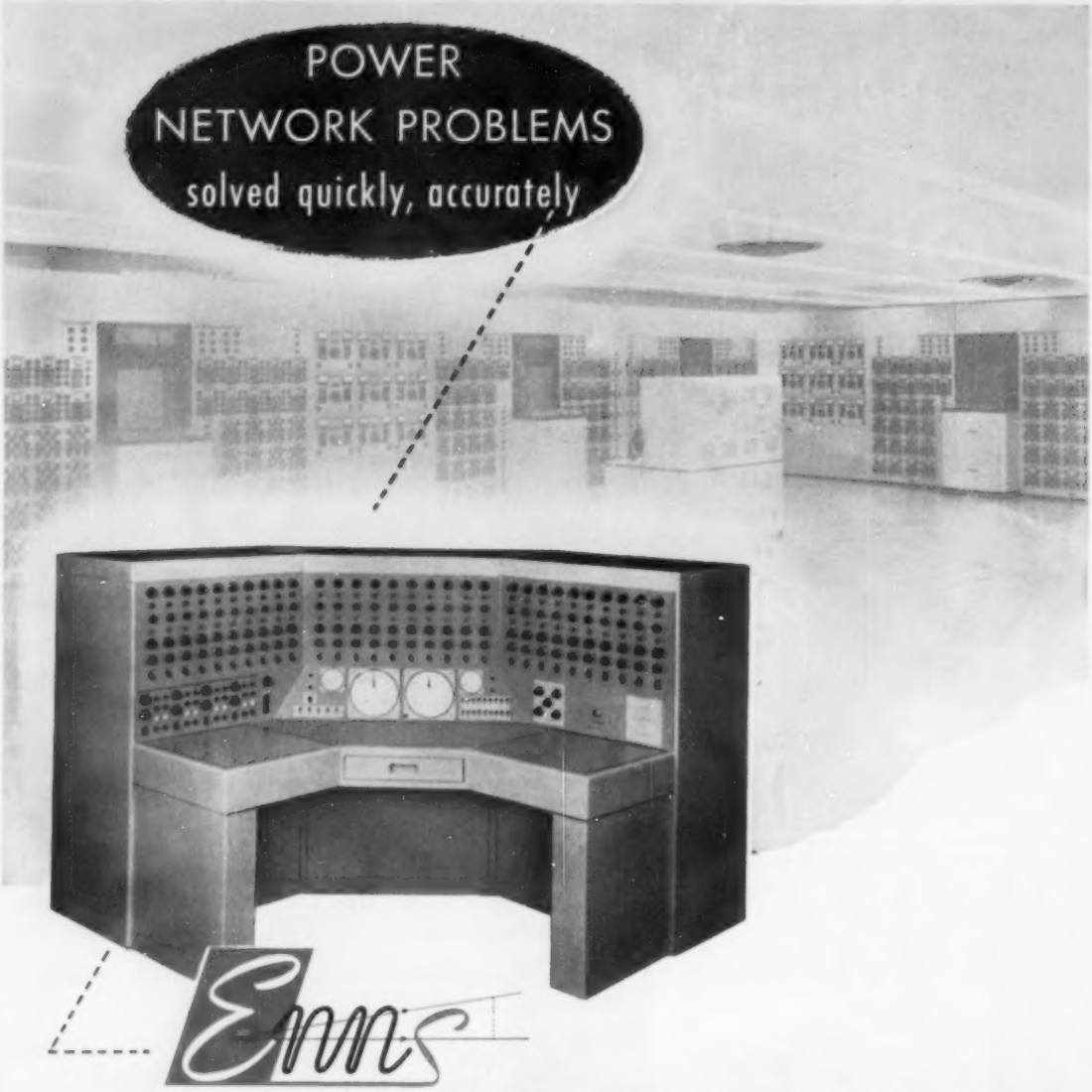
4421 RAVENSWOOD AVENUE
CHICAGO 40, ILLINOIS, U. S. A.

IN CANADA:
S & C ELECTRIC CANADA, LTD.
5 Vanson Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

Specialists in High-Voltage Circuit Interruption

POWER
NETWORK PROBLEMS
solved quickly, accurately



Enns

ENNS POWER NETWORK COMPUTER

NOW... for the first time... a *low cost* power network analyzer specifically designed for the power industry.

One man can accurately and rapidly solve—

- ✓ **AC load flow and voltage regulation problems.**
- ✓ **DC load flow problems.**
- ✓ **Three phase faults.**
- ✓ **Single and two phase faults to ground.**
- ✓ **Transformer tapping problems.**
- ✓ **Any study capable of solution on a DC board.**

Write for detailed information.

Phantom photo: An AC network analyzer built for a U. S. Government Power Administration by Electronic Contractors, Inc.

ELECTRONIC CONTRACTORS, INC. • 2205 East Burnside Street • Portland 15, Oregon

Urquhart
UNIT NUMBER 3

ANOTHER COORDINATED STEP BY

SOUTH CAROLINA GENERATING COMPANY

a subsidiary of

SOUTH CAROLINA ELECTRIC and GAS COMPANY

At Beech Island, S. C., on the east bank of the Savannah River, Unit Number 3 of the Urquhart Station has started operation.

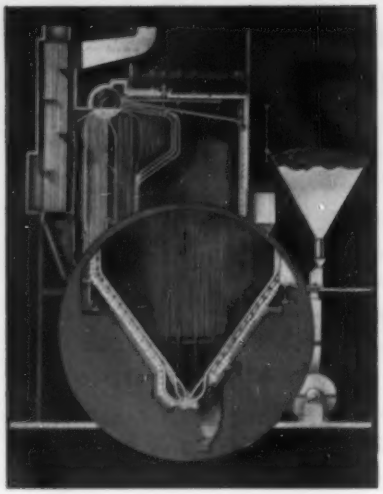
This Unit is part of a power plan to keep pace with and encourage the rapid industrial and domestic expansion of the area. It consists of a 100 megawatt Turbine Generator operating at 1800 psig pressure, 1000°F initial and 1000°F reheat temperature.

The close teamwork of the South Carolina Electric and Gas Company, Gilbert Associates, Inc. and all the contributing manufacturers and contractors brought the advantage of many skills and uncounted years of experience to the development, design and construction of this newest Unit at Urquhart Station.

Congratulations . . . and thanks to every member of the team.

A SYMBOL OF PROGRESS — BAI — FOUNDED 1906

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PENNSYLVANIA, U. S. A.



a practical money-saving design feature* of Riley Steam Generating Units . . .

RILEY

Single Header

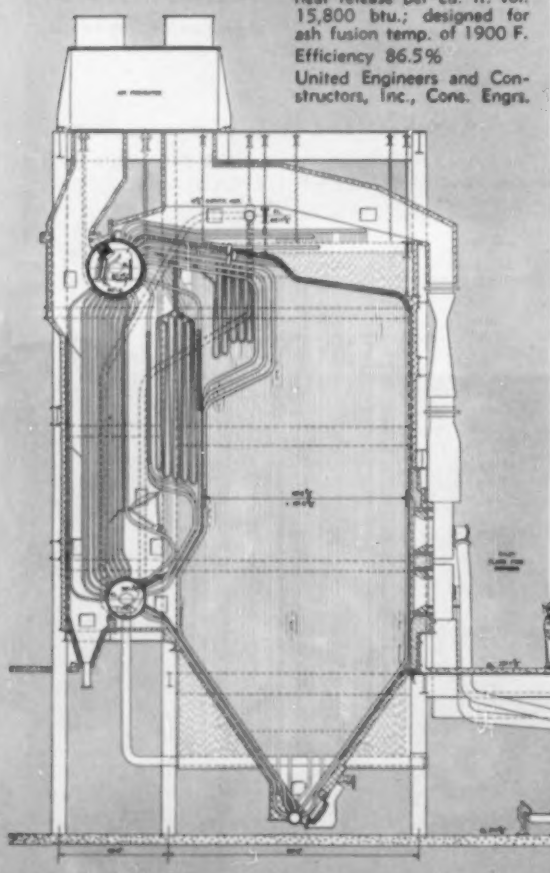
HOPPER BOTTOM

recommended by scores of public utility and industrial power plant engineers and consulting engineers

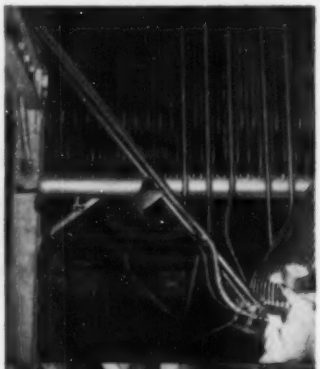
*Patented

Western Electric Company Hawthorne Works, Chicago, Ill.

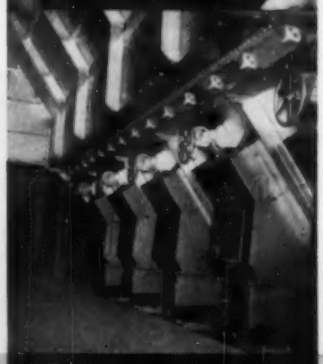
Capacity 150,000 lbs/hr. 835 F/1000 psig; furnace heat release per cu. ft. vol. 15,800 btu.; designed for ash fusion temp. of 1900 F.
Efficiency 86.5%
United Engineers and Constructors, Inc., Cons. Engrs.



Partial tube assembly of Single Header Hopper Bottom. Offset tubes at header provide openings for ashes to pass into ash removal system. Lower sidewall header is shown.

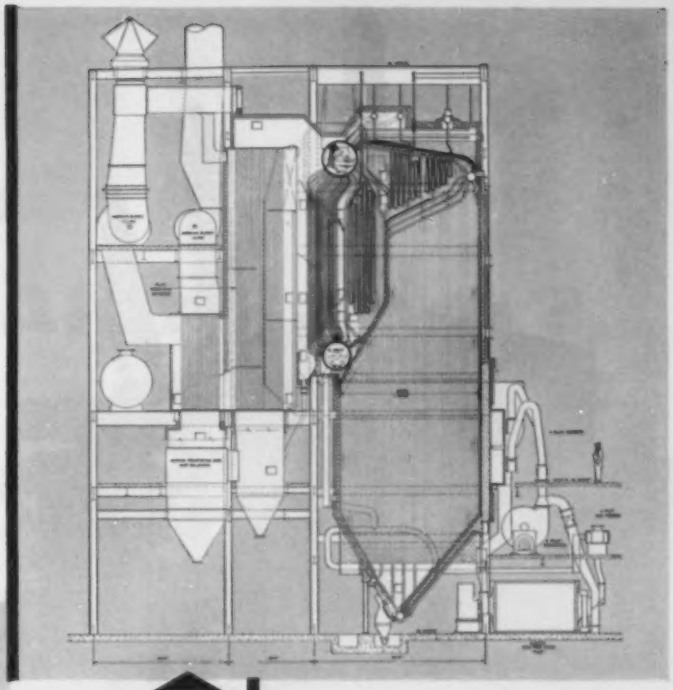


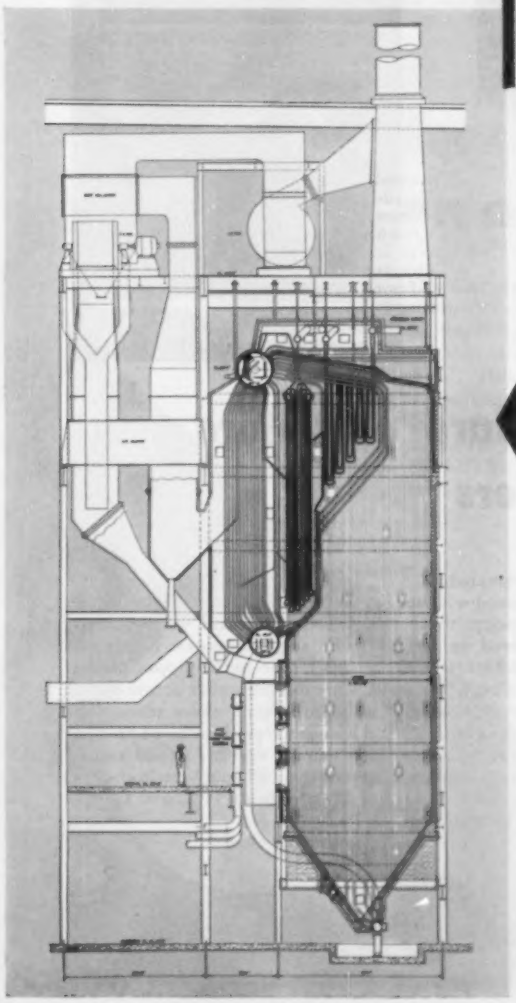
Typical ash removal system for Riley Single Header Hopper Bottom showing gate controls, access doors, and pipe for hydraulic system.



Your nearest Riley Representative will gladly furnish you with further details about Riley Single Header Hopper Bottom installations, or write to Riley Stoker Corporation, Dept. A, Worcester, Massachusetts.

- Successful with all types of high ash coals, even with ash fusion temperatures as low as 1900 F. No ash removal difficulties.
- Ideal for units firing a combination of coal, oil and/or natural gas, or, where coal may be used in the future.
- Integrated design eliminates the cost of separate hopper, and seals between unit and hopper with their maintenance.
- A convenient pneumatic or hydraulic ash removal system may be added.
- Reduces over-all building height . . . permits higher capacity unit in existing building.
- Adaptable to units of any capacity.





Dairyland Power Cooperative
Cassville, Wisconsin
Capacity 230,000 lbs/hr; 900 F/1000 psig; furnace heat release per cu. ft. vol.-19,300; designed for ash fusion temp. — 1980 F.
Efficiency 86.0%
Vern E. Alden Co., Consulting Engineers.

South Carolina Public Service Authority
Moncks Corner, S. C.
Capacity 450,000 lbs/hr.; 900 F/925 psig; furnace heat release per cu. ft. vol.-17,000; designed for ash fusion temp. — 2150 F.
Efficiency 87.7%
Ford, Bacon & Davis, Consulting Engineers.

A few users of over 150 units sold

Otter Tail Power Co.
Central Ohio Light & Power Company
Bird & Son, Inc.
So. Nevada Power Co.
Upper Peninsula Generating Company
Western Colorado Power Co.
City of Rochester, Minnesota
Central Electric Power Corporation, Linn, Mo.
Waldorf Paper Products, Inc.
Esso Standard Oil Co.
General Electric Co.
Allis-Chalmers Manufacturing Co.
Ohio Oil Company
Goodyear Tire & Rubber Company
Hooker Electrochemical Co.
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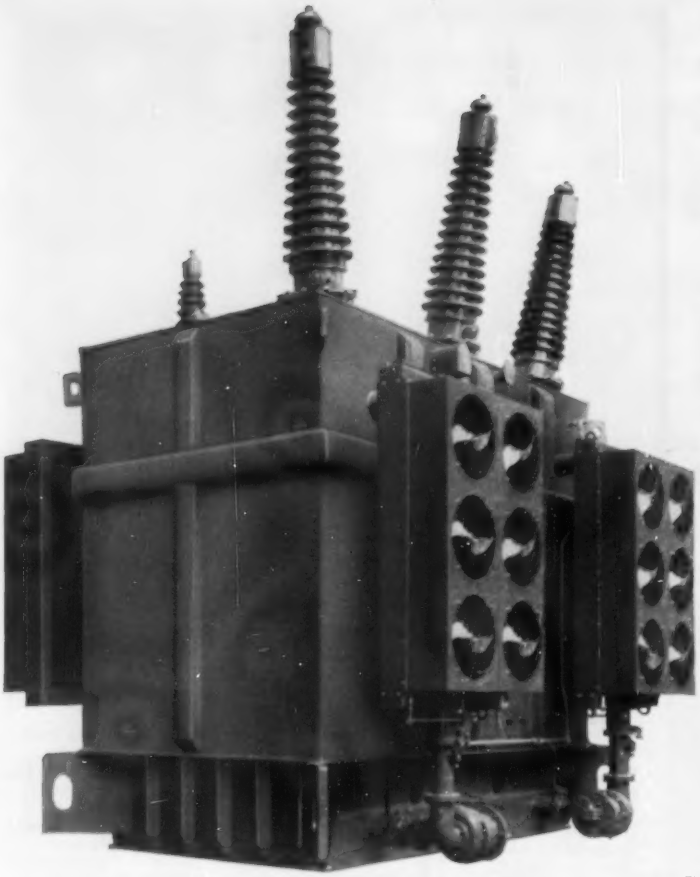
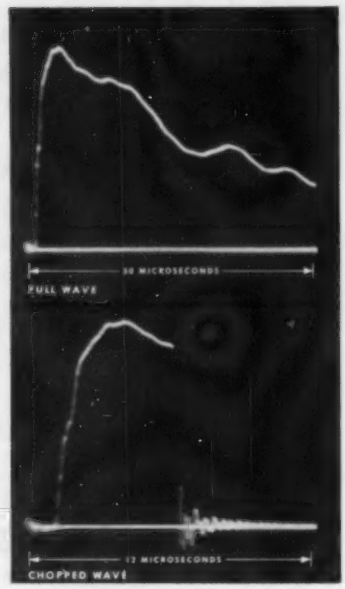
A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

RILEY
Stoker Corporation
WORCESTER, MASSACHUSETTS

Boston, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Tulsa, Houston, Denver, Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.



Oscillograms of basic types of impulse test waves, proving Westinghouse power transformer quality.



ONLY AT WESTINGHOUSE . . .

IMPULSE TESTING is now standard procedure for all large power transformers

In 1931, Westinghouse pioneered impulse testing of power transformers . . . now again in 1955, Westinghouse leads the industry in announcing the impulse testing of *every* power transformer rated above 10,000 kva and 69 kv and above. Each one . . . quality controlled . . . on the production line. These tests, which long have been a Westinghouse extra of quality manufacturing, are now standard procedure—an added assurance of ability to withstand all voltages encountered in service.

Basically, impulse testing proves the dielectric strength of transformer insulation. The searching power of these surge voltages proves the soundness of design, materials, and craftsmanship.

Conducted with surge generators of over three-million-volt capacity, these tests produce typical wave shapes encountered in service. The sequence—one full wave at reduced level (50% to 70%), then two chopped waves and one 100% full wave. This testing under actual operating conditions is doubly important when service to customers is more dependent on larger blocks of power.

For more complete information on this added assurance of transformer dependability, call your Westinghouse sales engineer, or write Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa. J-70754

YOU CAN BE SURE . . . IF IT'S

Westinghouse

Copper

or Aluminum?

Determine the Application then Specify...

MIDLAND

WEATHERPROOF WIRE

If the job calls for good distribution with a minimum wire diameter . . . where there are no hanging problems requiring special skills, special tools or accessories . . . and where high scrap value is to be considered . . . then copper is your answer. But if it's a long transmission run, specify Midland aluminum. But remember . . . whatever your weatherproof wire requirements may be . . . Midland can fill the order. Made to ASTM standards or your own special specifications.

Midland weatherproof cotton braided wire has been specially constructed to give you unusually long life with little or no festooning. Planetary stranding with a more flexible knitted covering that has been saturated at a uniform temperature and length of time during a separate operation is an "exclusive" with Midland and assures you of the very best. Look for the wire in the bright orange wrapper . . . it means quality . . . it's MIDLAND.

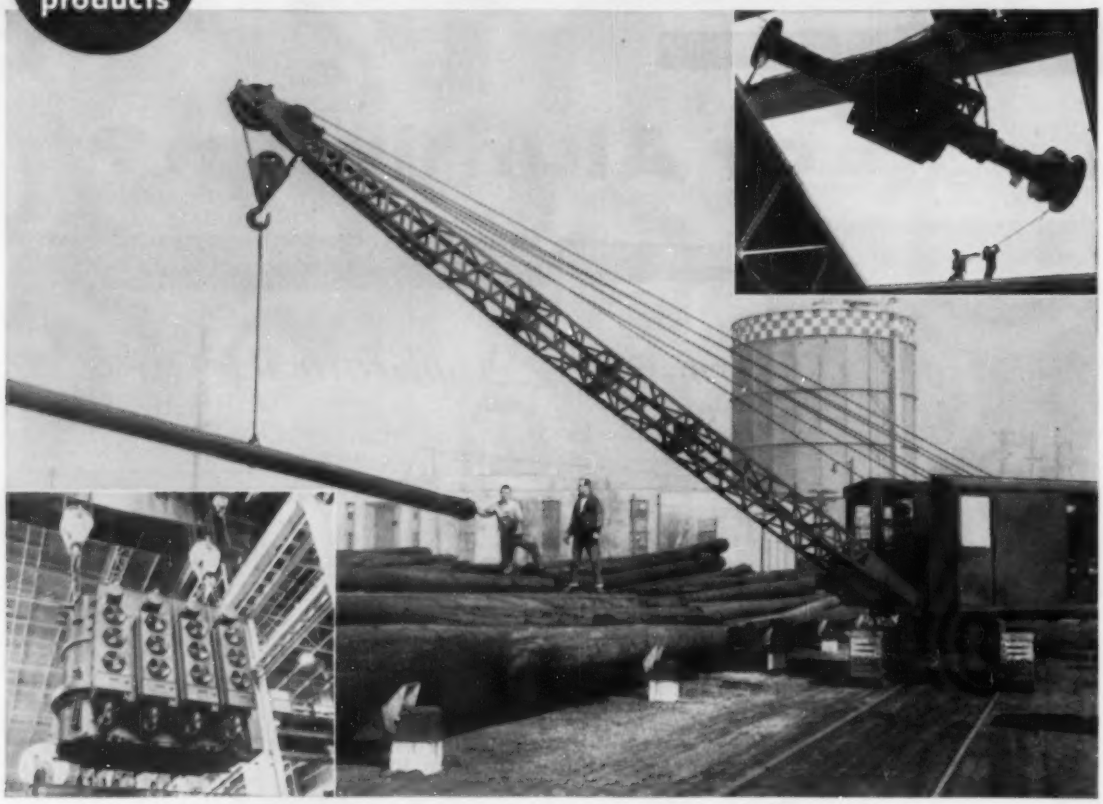
MIDLAND WIRE CORPORATION
DIVISION ESSEX WIRE CORPORATION
Factories at Birmingham, Alabama, Anaheim, Calif., Tiffin, Ohio

MIDLAND WIRE CORPORATION

ACCO products

ACCO Registered* Wire Rope Slings

THE STANDARD OF EFFICIENCY AND SAFETY



UTILITIES AND MANUFACTURERS AGREE—

"This Safety Measure Saves You Money"

• Whether you're lifting giant rotors, 140 ton transformers, or transmission poles, materials handling in utility and electrical manufacturing operations is ticklish business. A dropped load can cause tremendous losses through ruined equipment and disrupted operations.

That's why more and more utilities and manufacturers of electrical equipment are specifying ACCO *Registered* Wire Rope Slings for all lifting operations. For ACCO *Registered* Slings incorporate extra safeguards which make them the safest slings available.

Each individual component, made from the best material suited for its use, is individually tested—must prove to have strength equal to or greater than the sling body. These components are assembled into slings according to carefully engineered designs that have been proved in extensive field tests. The completed sling is then proof tested at twice the capacity for which it is rated. Then and only then, is it awarded the coveted ACCO *Registered* certificate and tag.

This extra care in manufacture and testing obviously makes ACCO *Registered* Slings safer. It also makes them more economical in the long run. For the precise design and manufacture insures that the sling is ideally adapted to the use for which it is intended—which pays off in longer sling life and lower lifting costs.

As an example, consider the ACCO *Registered* Slings used in the pole lifting operation above. Their special cable-laid construction gives them all the flexibility of manila rope with the strength of steel. Tops in ease of handling, they resist kinking and abuse . . . give longer, more economical service.

See your ACCO distributor or get in touch with any of our branches listed below.

*Trade Mark Registered

FREE Riggers' Notebook

• Fifty-six page booklet includes data on sling use, tips on sling care, rated capacity information on all types of wire rope slings.

Write today for your copy

ACCO

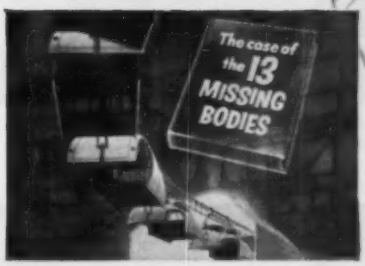
TRADE MARK

Wire Rope Sling Department
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. • In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

Better Value

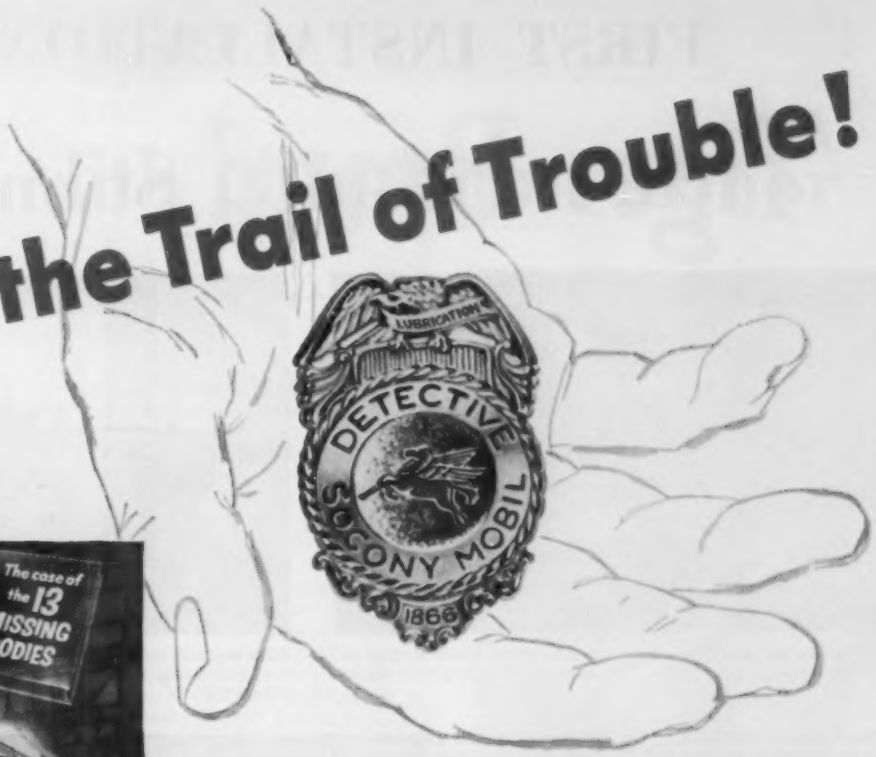
On the Trail of Trouble!



This auto plant had conveyor belt trouble. A Socony Mobil man cured it—saved $1,300 per hour!

Grease spots plagued this large felt mill. A Socony Mobil man ended them—saved $10,000 a year!

These coal miners kept breaking down. A Socony Mobil man stopped this—saved $8,720 annually!



This Flying Red Horse "Sleuth" can solve your problems, too!

His name may be Smith or Jones or Brown. He may be tall or short—blonde, brunette or redhead. But, in each case, he is a master "sleuth"—skillfully trained to track down the culprits that may be robbing your plant of production, material, money.

He is your Socony Mobil man—a lubrication expert who has solved thousands of mystifying cases of trouble in industrial plants. And he has saved plant owners literally millions of dollars with his solutions.

His exploits, in case histories like those reproduced here, are well worth reading—give clues to how he may save money in *your* plant. Now you can read more about him in a special issue of our magazine—"OIL POWER"—just off the press. It will pay you to get a copy. Just write: Socony Mobil Oil Company, Inc., 26 Broadway, New York 4, N. Y.

SOCONY MOBIL

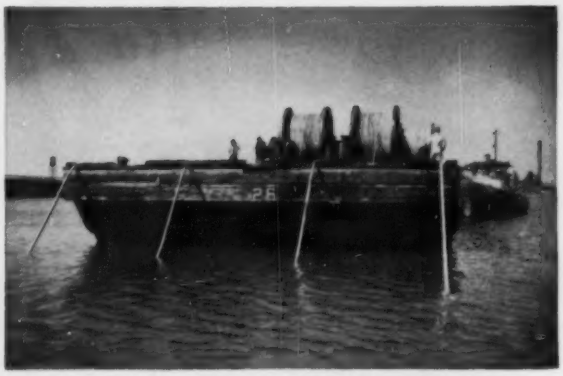
Correct Lubrication

FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.
Formerly Socony-Vacuum Oil Company, Inc.

FIRST INSTALLATION in the Tiger Brand Submarine

The first step. Cable is winched to shore where it is terminated at top of pole. This is only one of four such cables.



Barge begins to move across river. The four cables are kept about 10 feet apart all the way. 4th cable is a spare for future use.

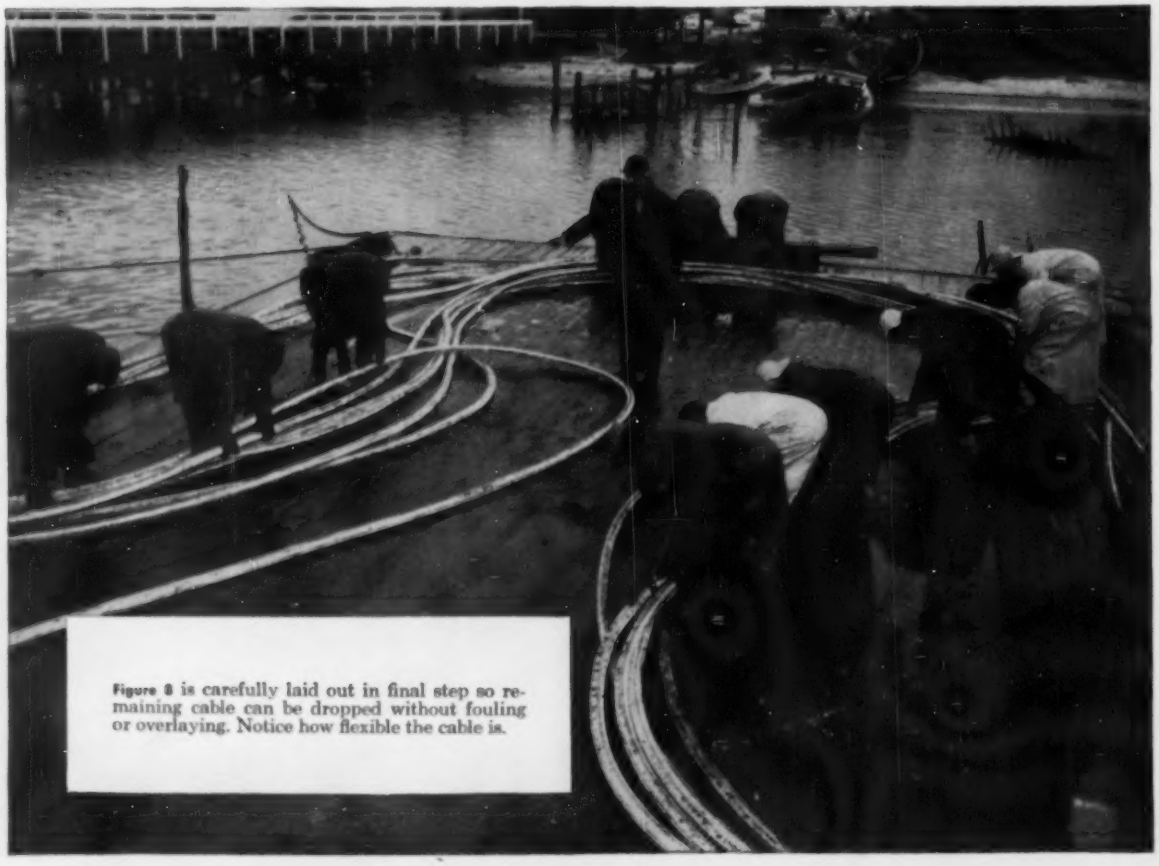


Figure 8 is carefully laid out in final step so remaining cable can be dropped without fouling or overlaying. Notice how flexible the cable is.

United States:

Cable with aluminum armor —in salt water

Here, J. F. Crofton, an independent diver, goes to the bottom to check for fouling. Cables lie in 5 to 10-foot-deep trench, will operate at 34.5 KV.

VIRGINIA ELECTRIC & POWER COMPANY has been using Tiger Brand for 31 years—but the installation shown here features a radical departure from standard cable constructions. To span the brackish Elizabeth River, VEPCO sunk four 3000 ft. single conductor 500 MCM paper lead cables rated at *38,000* volts. The armor is #6 BWG aluminum alloy type 52S-H34, covered with asphalt and jute.

This new aluminum armor is 70% lighter than conventional armor, so it will be much easier to lift the cable if it fouls. The company expects 20 to 30 years of service from the cable.

Why they picked aluminum armor: Because of its non-magnetic properties, the aluminum armor reduced power losses, and it reduced reactive voltage drop. The light weight was also a factor, since it made repairs easier. Extensive tests indicated that corrosion would not be a problem, even in these saline waters.

Just name your expected operating conditions—and there's a good chance that we can supply a standard Tiger Brand cable to do the job. High voltage underwater power cable, flexible dredge cable, cable for power shovels, mine cars or portable hand drills . . . Tiger Brand is designed for those unusual applications where highest possible quality is a must. Call your American Steel & Wire representative.

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A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB!

- asbestos wire and cable
- mold cured portable cord
- aerial, underground and submarine cable
- shovel & dredge cable
- paper & varnished cambric cable
- machine tool & building wire
- special purpose wire & cable

USS Tiger Brand **ELECTRICAL WIRE & CABLE** USS

UNITED STATES STEEL

Installation photographs courtesy of Berko Electric Manufacturing Corp.

You can recommend this radiant heat panel confidently

The wall-mounted heating units illustrated above are made and sold by the Berko Electric Manufacturing Corp., Queens Village, N. Y. Owners of such Berko heaters are enthusiastic about the comfort, convenience and safety they provide.

The heating elements in these heaters are PYREX Radiant Glass Panels. You can expect your customers to have confidence in any heater you may recommend with a PYREX panel heating element, as they are already familiar with other PYREX brand products having excellent heat-resistant qualities.

PYREX Radiant Panels are made of heat-resistive glass with an electrically conductive coating inseparably bonded to the entire back surface. Thin silver strips bonded to opposite edges of the panel distribute the current *evenly* over its entire length and breadth. This provides completely uniform heat radiation.

Efficient

PYREX Radiant Panels radiate about double the heat of a metal-finish radiator at the same operating temperature. This high degree of efficiency helps bring the cost of electric heat within reach of more homeowners. Also, there is little initial surge of current when these panels are turned on—another point of economy.

The coated side of the panel itself acts as a heat reflector. With the addition of a metal reflector, as much as 80% of the input energy is available as heat radiation from the panel's uncoated side.

At 400°F. over 75% of the panel's heat energy is emitted in wave lengths of four microns and longer. This energy provides instant warmth and comfort.

Customer benefits

PYREX panels provide clean, draftless heat and the panels themselves are easy to wipe clean. Free dust particles will not adhere to or carbonize on them. In-the-wall installation leaves completely free floor space and installation is easy. There's space saved, too, because there is no heating room. Every room is individually thermostatically controlled. The glass is high in physical strength. It's safe and durable.

For additional technical information on PYREX Radiant Panels, write, wire or phone.

CORNING GLASS WORKS, CORNING, N.Y.
210 Crystal Street
Corning means research in Glass

1 **Built-in Provision for Load Growth**

2 **Flexibility... Unequal Ranges Available**

3 **Simplified System Maintenance**

NOW-

all Allis-Chalmers Voltage Regulators give you the

Vari-Amp Feature

Every Allis-Chalmers regulator now has five steps over which current capacity can be increased by reducing the range of regulation. To get more capacity, just reduce the range of regulation by changing the *Vari-Amp* setting.

To get the story

on the *Vari-Amp* feature on all three types of Allis-Chalmers voltage regulators,

turn the page

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-4904

For Bus Regulation

Vari-Amp Feature Provides for Load Growth

The *Vari-Amp* feature on Allis-Chalmers three-phase power regulators makes possible considerable economies for bus regulation. Whenever greater regulator current capacity is needed, it can be obtained by reducing the range of regulation. Then, transformer tap can be changed to obtain desired voltages.

In effect, the regulator has several ratings, making it possible to meet changing conditions caused by adding transformer capacity, increasing transformer ratings by addition of forced air, or transfer of a regulator from one substation to another.

An example of applying three-phase regulators with the *Vari-Amp* feature to a substation is shown in the box below. The *Vari-Amp* feature permits increasing rated bus current from 100% to 126% and the bus voltage may still be varied from 95% to 110%.

Above: *Vari-Amp* will provide important economies for bus regulation on installations like this. Below: Example shows rating increases for one type of system.

	Without Vari-Amp	*With Vari-Amp*
Transformer Voltage	100%	105%
Regulator Range	±10%	+5%, −10%
Bus Voltage	90% to 110%	95% to 110%
Rated Bus Current	100%	126%

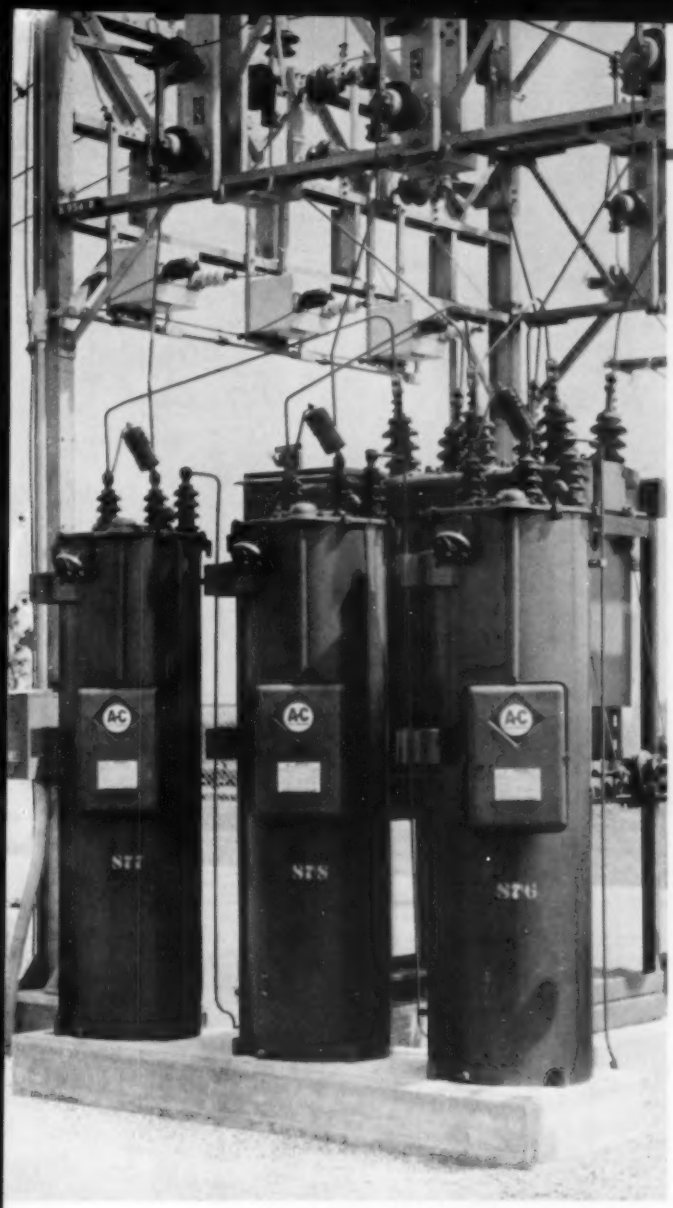
1 — Built-in Provision for Load Growth

The *Vari-Amp* feature on every Allis-Chalmers regulator means you get five ratings from a single regulator. By reducing the range of regulation, you can increase current ratings. You get more uses for each Allis-Chalmers regulator with this built-in provision for load growth.

2 — FLEXIBILITY... Unequal Ranges Available

Unusual flexibility is now available in Allis-Chalmers regulators because you can obtain unequal ranges of regulation in either direction. If your system requires, you can increase capacity in one direction by reducing range of regulation while leaving the capacity and range of regulation in the other direction unchanged.

ALLIS-



For either substation or feeder regulation, the *Vari-Amp* feature permits designing regulator operation to meet specific system needs.

For Distribution Regulation

Vari-Amp Feature Lets You Tailor a Unit to Your System's Needs

Since regulation requirements of different systems—and even on different parts of a system—vary greatly, addition of the *Vari-Amp* feature to Allis-Chalmers distribution regulators opens new possibilities for tailoring a unit to fit various requirements. In the past, it was necessary to use ± 10% regulation regardless of the needs of the system. Now you get exactly the range of regulation you need and, in many cases, a sizable "extra" in more current-carrying capacity.

On distribution regulators, the *Vari-Amp* feature lets you increase ratings as much as 60% in five steps from ± 10% range down to ± 5% range. You get considerable flexibility through use of unequal ranges of regulation. For example, you can set for 6¼% raise to get 135% current, and 10% lower at 100% current.

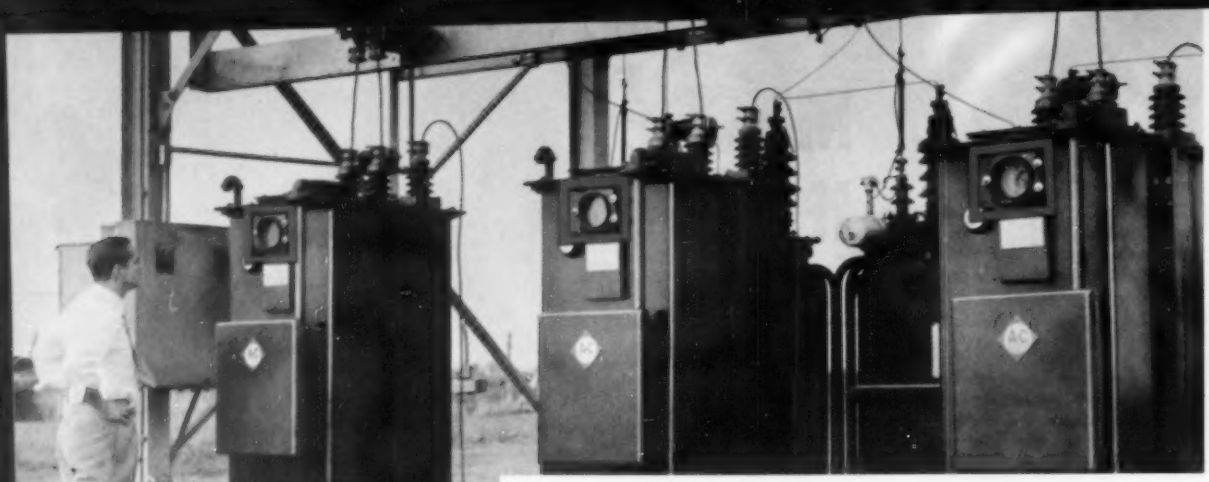
Best of all, this important feature is on all Allis-Chalmers regulators. You get more uses, more capacity for each regulator.

3— Simplified System Maintenance

Planned outages to inspect or maintain equipment will be easier, far less costly in overtime manpower. Because Allis-Chalmers voltage regulators with the *Vari-Amp* feature can carry so much more load, it is easy to shift the extra load to them during the week instead of during light load periods on Sundays and holidays. The same advantages make it easier to cope with unexpected emergencies, because the *Vari-Amp* feature lets Allis-Chalmers ⅝% step voltage regulators carry more load when other circuits cannot be used.

★ Originators ⅝% Step Regulation

CHALMERS A-C ALLIS-CHALMERS



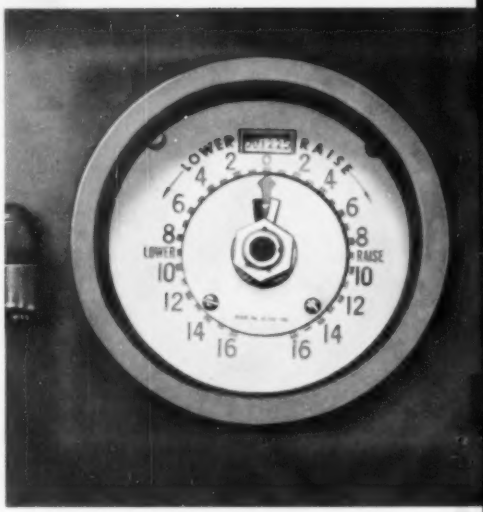
***Vari-Amp* Feature**
IN OPERATION FOR 15 YEARS

On Single-Phase Power Regulators

ALLIS-CHALMERS
5/8% STEP VOLTAGE REGULATORS

. . . from a utility engineer's report

"Vari-Amp Feature Lets Relay Man Change Ratings on Two Regulator Banks In 15 Minutes"



Utility engineers have been utilizing the advantages of the *Vari-Amp* feature since 1940 on Allis-Chalmers single-phase power regulators. It takes just three simple steps to change the rating of an Allis-Chalmers single-phase power regulator. That's compared to the 10 complex operations required on other types of regulators. And you get five ratings in a single regulator instead of the two provided on other regulators.

Get the full story on the convenience, flexibility and reliability of Allis-Chalmers step regulators with the *Vari-Amp* feature. See your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-4804

ALLIS-CHALMERS

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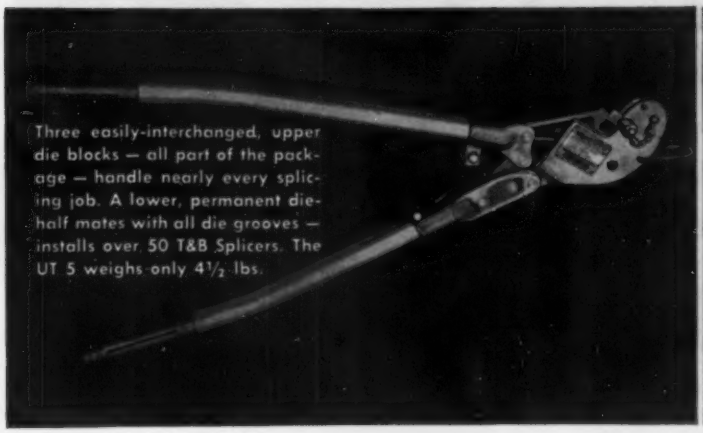
T&B's COMPLETE SPLICING PACKAGE *for*

COPPER
Solid and Stranded
#8 stranded to #2 stranded

ALUMINUM
Solid and Stranded
#6 solid to 2/0 stranded

A.C.S.R.
#6 (6x1) to 1/0 (6x1)

THE UT 5 INSTALLING TOOL...AND THE SPLICERS



Three easily-interchanged, upper die blocks — all part of the package — handle nearly every splicing job. A lower, permanent die-half mates with all die grooves — installs over 50 T&B Splicers. The UT 5 weighs only 4½ lbs.

One UT 5 Installing Tool is all that's needed to splice a wide range of service and distribution conductors. Switch to T&B and use *one* tool instead of many; slash tool costs and inventories to a minimum.

High mechanical advantage of the UT 5 tool minimizes manual effort required to make strong, electrically efficient splices. Hardened steel dies force splicer and conductor into a *square*-sectioned, homogeneous mass. Compound lower die design provides a high-unit-pressure area for installing the steel core of A.C.S.R. Dies are easily changed by loosening a single thumb screw. No tools required. Die grooves and connectors are conveniently letter-coded to assure proper die selection.

Let your T&B Distributor demonstrate the UT 5 and its many advantages . . . see how one UT 5 does the work of a dozen or more tools.

T&B Bulletin 71 gives the full story on the UT 5 Installing Tool and the wide range of T&B Splicers that it will install. Send for your *free* copy today.

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The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-427

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Underwriters' Approved Safety (Type m.i.) Wiring Systems offers lower installation and maintenance costs. Acts as its own conduit . . . can be installed in one operation with standard switch and junction boxes. Easily shaped on the job, Safety m.i. can be fastened with standard clamps or straps . . . stays put permanently!

Save time and money! Get a neater job! Simplify planning! Ask your General Cable Representative for all the facts about Safety m.i. Wiring Systems. Remember, too, General Cable is the *only* manufacturer who can supply *all* your wire and cable needs!

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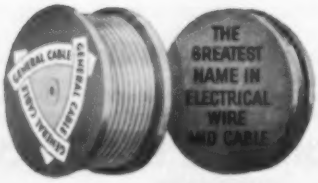

BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

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Variac® motor speed control for that *Difficult* Job

An engineer at the Gabriel Laboratories Needham, Mass., test site, accurately regulates the speed of rotation of a shipboard, long-range radar antenna with the aid of the G-R Variac Motor Speed Control.

A transmitting antenna across the valley from the test site beams a high-frequency signal in the direction of the test antenna as the latter slowly rotates through the horizontal plane. A servo system synchronizes the recording equipment with the Speed Control's output and, consequently, links the travel of the recorder chart with the angular rotation of the antenna.

The ability to slow the 20-foot wide antenna under test to near the stopping point, while maintaining constant speed and without torque pulsations, permits considerably more accurate radiation-pattern determinations. Beamwidths and side lobes of narrow-beam antennas can be very accurately measured with this equipment.

The superior operating characteristics of the G-R Variac Motor Speed Control ideally adapt this device to a wide variety of control situations . . . in Production Line, Research Laboratory, or Test Department.

This Control has been used, with equal success, to control the speed of small precision lathes, drill presses and jewelers equipment, and for controlling the operation of huge artillery-shell assembly machinery.

In production testing, the Variac Motor Speed Control checks calibration of electric production counters, and is used to control equipment for the wear testing of watch and clock journal bearings . . . in assembly-line operations, it accurately controls the feeding rate of strip steel and other materials on their way to automatic processing equipment . . . in experimental work, the G-R Control regulates the speed of metal rods passing through metalizing guns, and controls speeds of key elements in beta-ray thickness gauges. Finally, many concerns have seen fit to build the stripped-down version of this Control into equipment of their own manufacture to improve operating performance.

The Variac Motor Speed Control does the job where other controls are unsuitable because:

- ★ this device has a continuous and infinite range of speeds from a few rpm to top motor speed.
- ★ the rectified Variac output provides uniform torque, without chattering, under all operating conditions, even at very low speeds of a few rpm.
- ★ and finally, the compactness, simplicity and ruggedness of this equipment allows its use under practically all circumstances.

Variac Motor Speed Controls operate d-c motors from a-c lines . . . available with ratings from 1/15 to 1½ hp at prices from $75 to $495. Stripped-down models are available at lower cost, without shielding cabinet, fusing, switching and dynamic breaking, all of which can be incorporated easily in circuits of the user's equipment. For Complete Information, fill in coupon at right.

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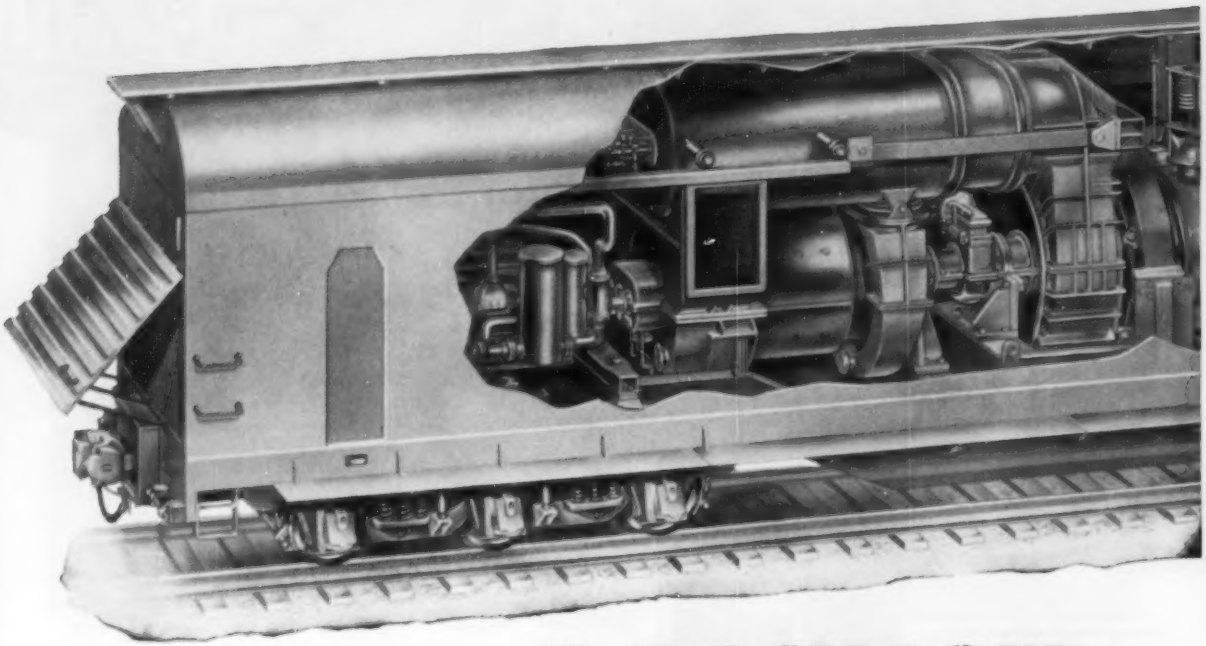
Revolutionary Clark development in mobile power generation



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Requires only connection to fuel source and electrical load.
No water nor outside power needed.

2 **ONE-MAN OPERATION**
Simple, pneumatic controls. Complete, built-in, dead front switchgear.

3 **MOVED AT HIGH SPEEDS**
Can be hauled on regular passenger or freight train service. All components specifically designed for mobile operation. Special, heavy duty car.

4 **QUICKLY PLACED IN SERVICE**
No site preparation required. Operates on any reasonably level track.

5 **3-POINT SUPPORT**
Car flexing does not affect alignment of power unit.

6 **DUAL FUEL OPERATION**
Burns wide range of liquid or gaseous fuels simultaneously or individually.

7 **SPLIT SHAFT DESIGN**
No alignment problem. No step-down gears between turbine and load. No physical connection between turbines.

8 **THERMO-ELASTIC DESIGN**
Hot parts expand without stress. No bearing misalignment.

9 **LONG LIFE — LOW TEMPERATURE**
Minimum blade life of 100,000 hours.

10 **AIR COOLED — NO WATER REQUIRED**

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12 **LIFETIME SINGLE COMBUSTION CHAMBER**

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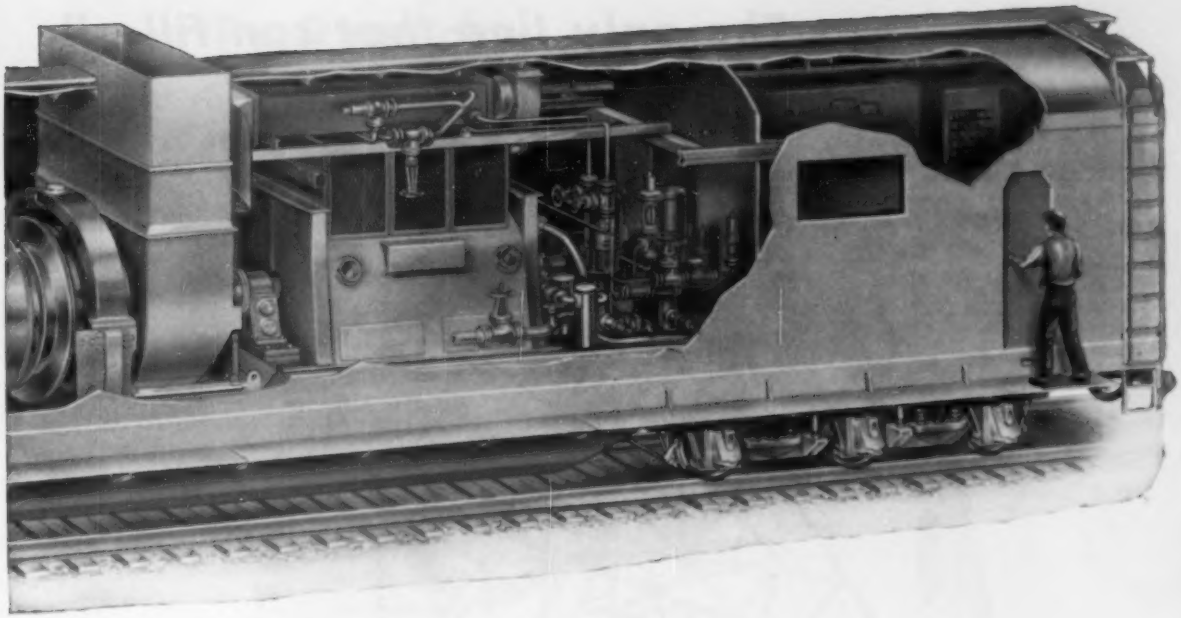
All exposed surfaces cool enough to touch

14 **FLEXIBLE ELECTRICAL CHARACTERISTICS**
Dual frequency. Operates in parallel with existing facilities or independently

15 **UNUSUAL ACCESSIBILITY**
All parts readily accessible for rapid inspection and servicing



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Clark engineers will gladly furnish details and discuss specific applications with you. Complete brochure mailed on request.

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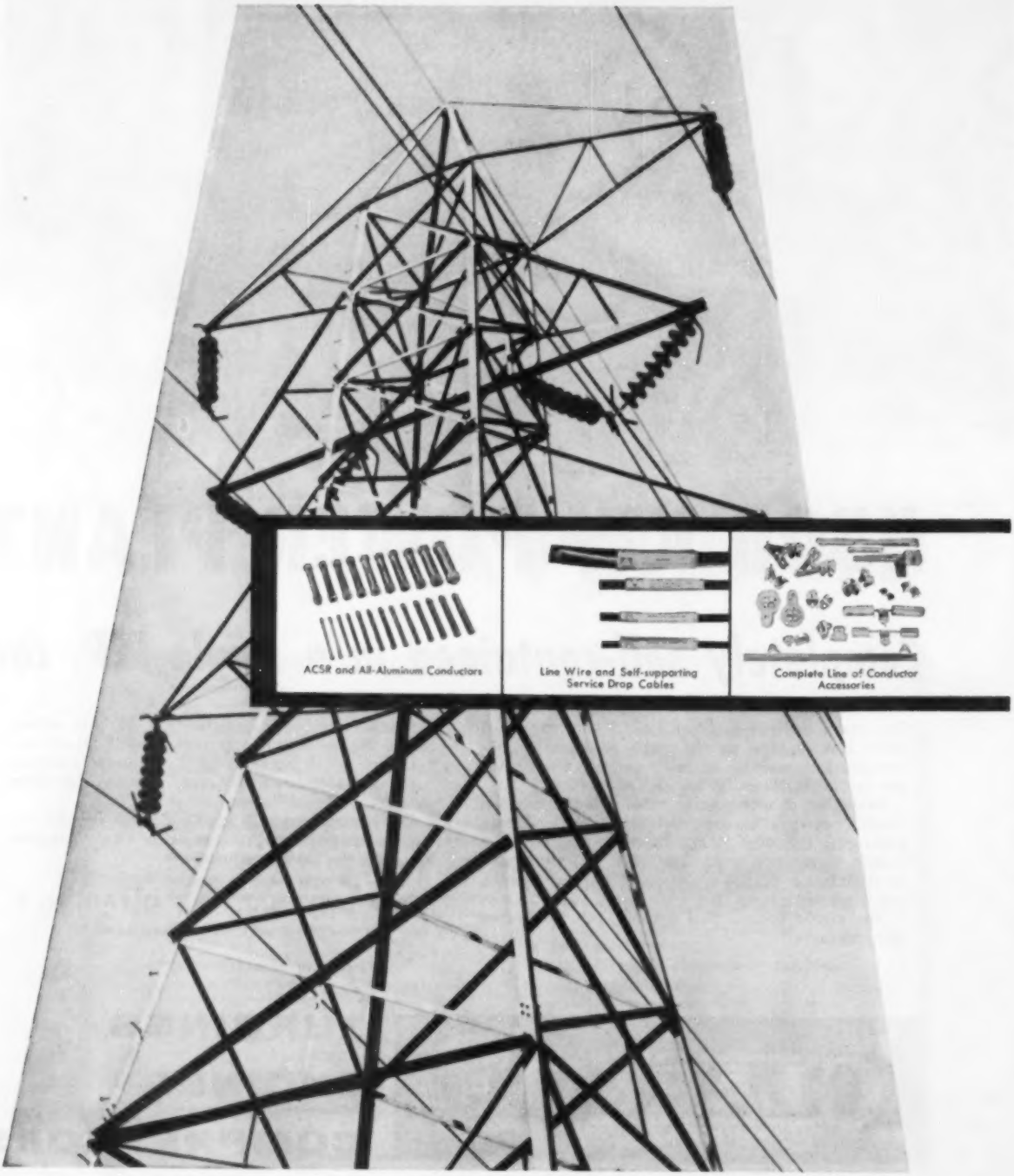
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Complete Line of Conductor Accessories

your T & D needs—

ALCOA® ALUMINUM CONDUCTORS and ACCESSORIES

Alcoa—and only Alcoa—offers a line of conductors and accessories to meet every system need from generator to consumer. Designed, engineered and produced by the world's most experienced manufacturer of aluminum conductors, this complete line offers utilities these major advantages:

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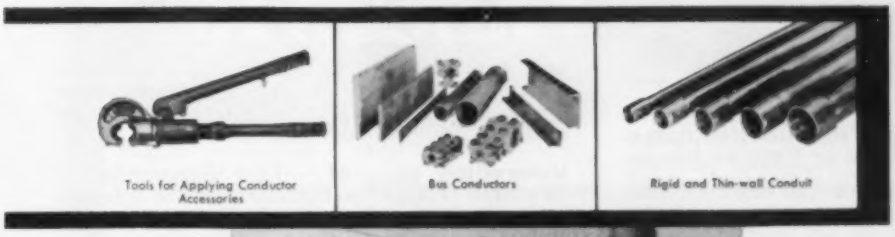
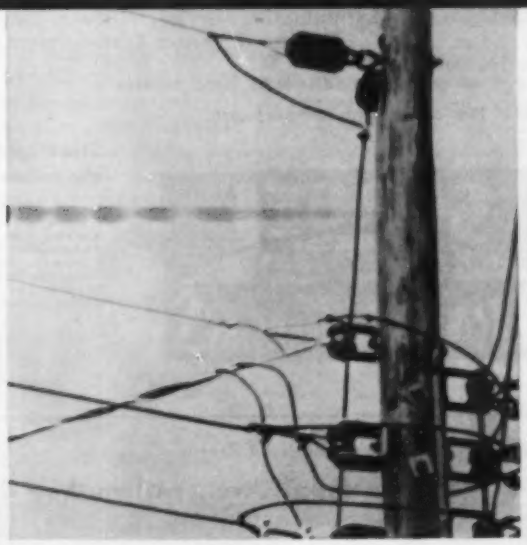
Aluminum Company of America, 2312-K Alcoa Building, Pittsburgh 19, Pa.



Tools for Applying Conductor Accessories

Bus Conductors

Rigid and Thin-wall Conduit



Your Guide to Aluminum Value

40 YEARS OF KNOW-HOW

During all these years we have been advocating higher interior distribution voltages and the installation of SORGEL dry-type transformers inside of buildings, at load centers, to provide greater efficiency and economy. This is now recognized as the best and most practical method of electrical distribution. SORGEL dry-type transformers are not just ordinary transformers that were converted to follow the trend toward air-cooled transformers. SORGEL dry-type transformers are designed and constructed especially for this purpose.

Liberal design for full rated load — SORGEL transformers are guaranteed to carry the full load continuously, and are so liberally designed that they can safely carry an overload during an emergency.

Quiet operation — The noise level is well below the established standards. Because of their quiet operation, SORGEL transformers are particularly adaptable for indoor installations close to load centers.

Rugged construction — All fabricated steel frames and enclosures. No castings or flimsy enclosures.

Easy installation — Attached wall brackets, with slots for bolts, or floor mounting base. No separate mounting brackets nor junction boxes to make or buy.

Easy connecting — Roomy connection compartment with wide choice of knock-outs. Equipped with solderless terminal lugs and permanent connection diagram.

Long life — Thermo-vacuum impregnated windings brazed to terminals.

Low final cost — The cost-saving features incorporated in SORGEL dry-type transformers are an assurance that their first cost is the final total cost.

Underwriters' approved — Less than one-half of all makes of dry-type transformers are approved by Underwriters' Laboratories under the re-examination service. (Check Underwriters' list of "approved" power transformers).

Trouble-free, and years of continuous hard service.

Safe, low operating temperature.

Complete Line

¼ Kva to 2500 Kva single phase.

1 Kva to 3000 Kva 3-phase, 2-phase, and phase changing.

All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts, and any intermediate or special lower voltage.

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TRANSFORMERS

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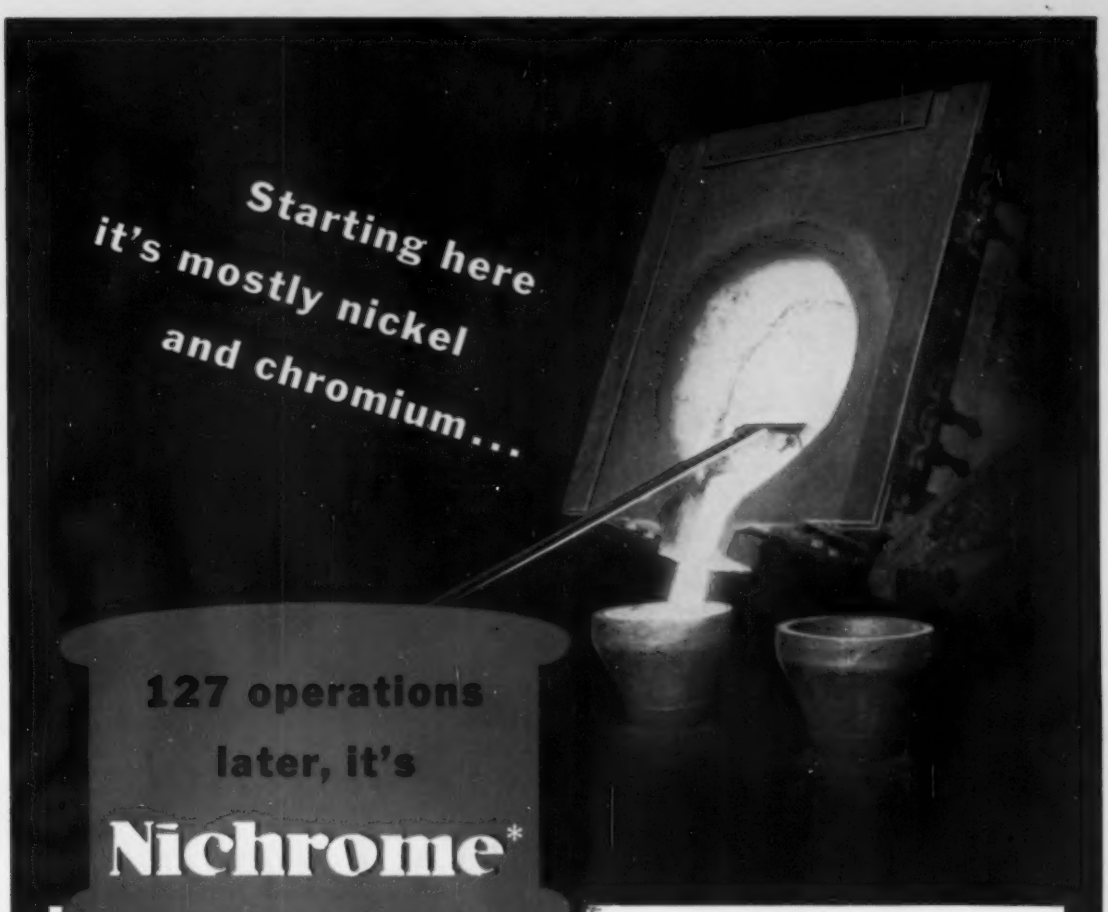
40 years' experience in the development, manufacturing and application of transformers



127 operations later, it's Nichrome*

There are several excellent nickel-chrome combinations on the market. But there is only one Nichrome*.

What is it that makes this alloy the universal standard by which engineers judge the properties of heat and corrosion resistance? There is always at least one extra ingredient added to the nickel and chrome. That is . . . the supreme mastery of the Driver-Harris specialists, gained in their 55 years of melting and drawing experience. This hard-won skill of theirs is reflected in improved heating and quenching techniques . . . in specially developed deoxidizing anneals . . . in expert and precise control of every technical process of the entire manufacturing cycle. Sometimes, indeed, there are as many as 127 distinct operations between melting crucible and the finished wire, strip, or rod.

In recognition of its unique properties, the United States Patent Office in August, 1908, granted solely and exclusively to us the trademark NICHROME. There is only one Nichrome, and it is produced by Driver-Harris.

Driver-Harris Company

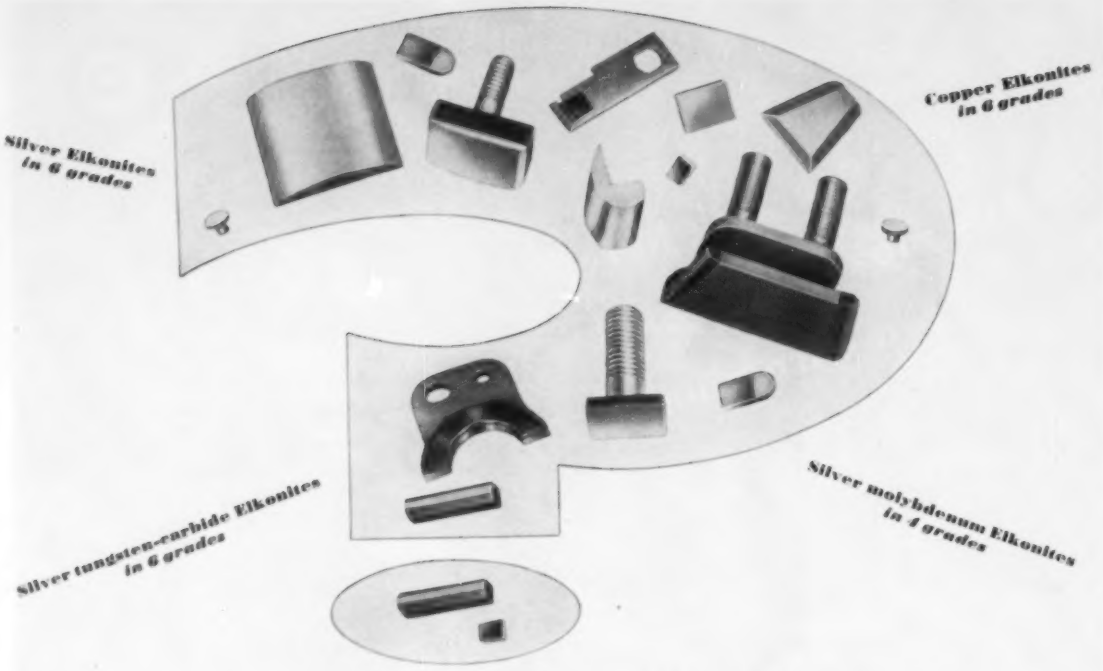
HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Louisville, Los Angeles, San Francisco

In Canada: The B. GREENING WIRE COMPANY, Ltd., Hamilton, Ontario.

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

*T. M. Reg. U. S. Pat. Off.


Silver Elkonites in 6 grades
Copper Elkonites in 6 grades
Silver tungsten-carbide Elkonites in 6 grades
Silver molybdenum Elkonites in 4 grades

which ELKONITE® *material*

fits your CONTACT *requirements?*

EVERY heavy duty electrical contact application poses its own problems. Electrical conductivity, contact resistance to arc erosion, sticking and welding, high mechanical strength, wear resistance . . . all of these qualities may be demanded in dozens of different combinations, and in many varying degrees.

To satisfy these diversified needs, Mallory has developed a complete series of Elkonite materials. By means of specialized Mallory metallurgical techniques, these materials combine metals which do not alloy by conventional means. They afford a combination of the electrical properties of copper or silver, with the refractory qualities of tungsten, molybdenum or their carbides.

From among the many Elkonites, you can choose a contact material that meets the electrical and physical specifications of your design. Often, combinations of dissimilar Elkonites (or the use of Elkonite with such materials as copper, silver or tungsten) give the best possible performance. Mallory Elkonites are *versatile* contact materials.

Call on Mallory for competent engineering assistance on your contact design problems. Call on our manufacturing facilities, too, to fabricate complete contact assemblies to your specifications. For technical data or a consultation on your application, write or call Mallory today.

In addition to the family of Elkonite materials for contacts, Mallory makes many other "families" of contact materials including silver, tungsten, molybdenum, platinum Elkonium®, palladium Elkonium, copper and copper alloys.

Expect more . . . Get more from

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical — Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

Here's an outstanding new development for RESIDENTIAL AREA LIGHTING

L-M's New Open Type Luminaire For Small Mercury or Incandescent Lamps

This completely new development in luminaires offers these advantages:

1. Pleasing appearance for residential areas.

2. Specially designed for the new 100 watt (3300 lumen) and 175 watt (6800 lumen) mercury vapor lamps.

3. Also efficiently handles incandescent lamps up through 6000 lumens.

4. Holophane® refractor glassware will provide type II 4-way offset, standard type II, type I, and type III patterns.

5. Open glassware provides for excellent cooling, larger lamps, easy re-lamping.

6. Alzak aluminum reflector, latched for direct attachment to Standard NEMA head.

7. L-M's V-band attachment provides easy replacement of glassware.

8. Modestly priced, but because of its design the luminaire handles much larger lamps than other luminaires at this price.

Ask the L-M Field Engineer for information on features, design, and delivery of the several types. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

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LINE MATERIAL

Street Lighting

ROADWAYS AND PARKING AREAS are lighted with L-M Spherolites® with mercury vapor lamps.

L-M Lights Roadways, Runways, and Ramps at General Mitchell Field

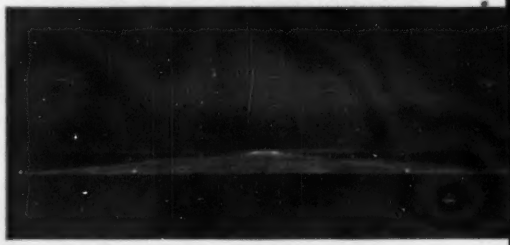
Milwaukee County's magnificent new air terminal at General Mitchell Field provides the latest facilities for comfort, convenience, and service of passengers flying in and out of the big midwestern metropolis.

The newly dedicated terminal is a beautiful low modern building nearly 1000 feet long. The arriving traveler finds such modern conveniences as automatic doors, escalators, the latest in lighting, a wide range of facilities for his comfort and convenience. The new airport is not only a great focal point for Milwaukee County but also a model for airline terminals everywhere.

Approach roadways and the huge 2000-car parking area are lighted by L-M mercury vapor units on steel poles. Loading ramps are illuminated by L-M's latest fluorescent luminaires, whose broad light sources provide ample illumination with a minimum of glare to incoming pilots. Runways for planes are marked with L-M's high intensity Thermal Beam™ runway lighting units.

L-M provides a complete line of incandescent, mercury vapor, and fluorescent lighting and equipment for outdoor installations—for street lighting, airports, roadways, shopping centers, parking areas. L-M's runway lights are the culmination of years of development by the leader in airport runway lighting. For complete information on L-M products and services, ask the L-M Field Engineer or Lighting Engineer; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

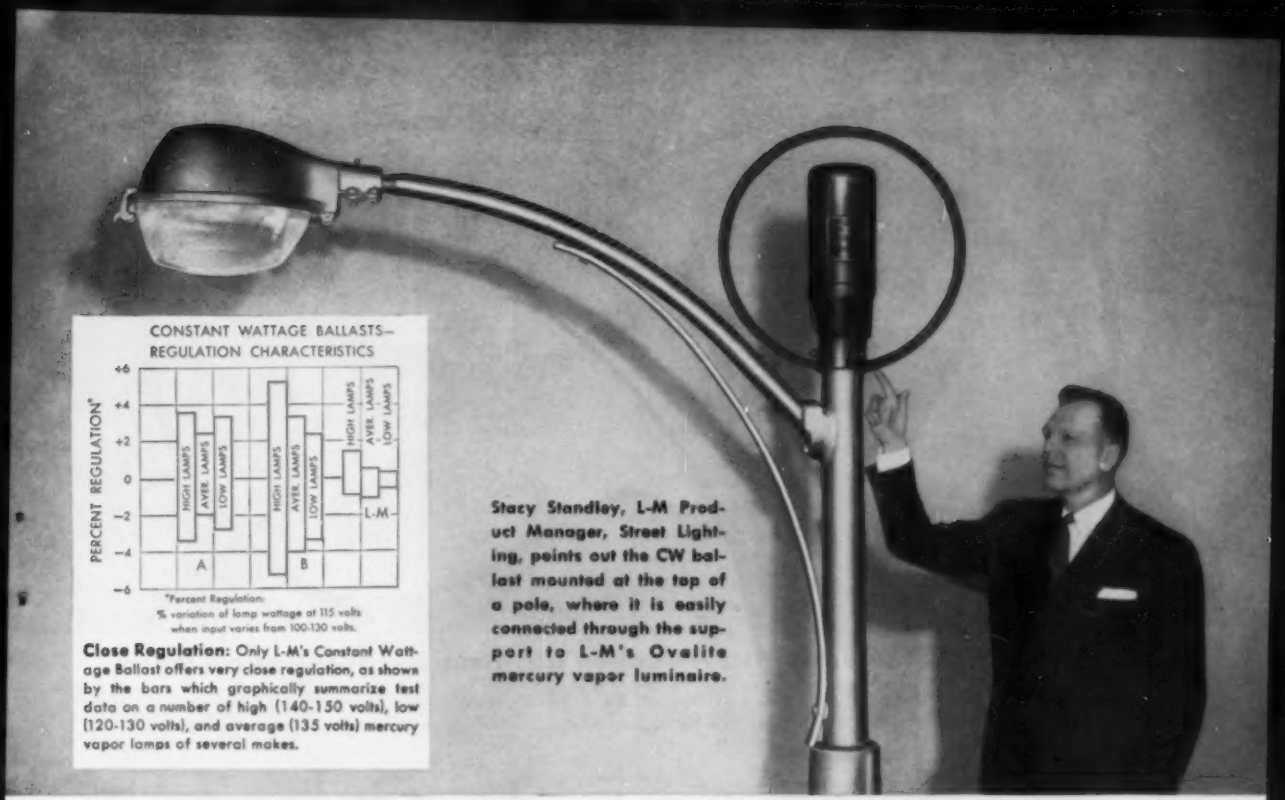
RAMP LIGHTING—154 of L-M's new fluorescent units provide a high level of illumination without glare to pilots.



RUNWAY LIGHTS—L-M's Thermal Beam units compensate in both intensity and direction for fog and other low-visibility conditions, by toeing in as intensity is stepped up, toeing out as intensity is lowered in clear weather. Smaller L-M lights light taxiways.

LINE MATERIAL

Street and Airport Lighting

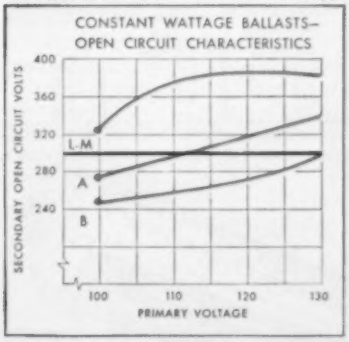


Close Regulation: Only L-M's Constant Wattage Ballast offers very close regulation, as shown by the bars which graphically summarize test data on a number of high (140-150 volts), low (120-130 volts), and average (135 volts) mercury vapor lamps of several makes.

Stacy Standley, L-M Product Manager, Street Lighting, points out the CW ballast mounted at the top of a pole, where it is easily connected through the support to L-M's Ovalite mercury vapor luminaire.

CW Ballast Assures Uniform Light Output . . . Outstanding Below-Zero F. Starting

L-M's new Constant Wattage (CW) Ballast assures more uniform individual light output for mercury vapor systems than do other mercury vapor ballasts. Regulation is within ±2%, even with voltage variations as much as ±13%.



Cold-Weather Starting: Heavy line shows the average voltage required to start mercury vapor lamps at −10 degrees F. L-M's CW is the only ballast providing this secondary voltage when primary voltage drops below 115.

"CW" and "Ovalite" are Line Material Company trademarks.

According to published data, at least 300 volts are required to start 95% of H-400 E-1 lamps at 10 degrees below zero, Fahrenheit. In tests (see curves at left) with two other constant wattage ballasts of approximative design, the L-M CW maintains the highest open-circuit voltage, and is the only one that maintains over 300 volts at primary voltages below 115. Therefore it will start lamps at temperatures well below zero.

According to L. F. Joy, Electrical Superintendent of the city of Fairbanks, Alaska, L-M ballasts gave no trouble whatever; and, Mr. Joy adds, no trouble was experienced in starting even at 50 degrees below zero.

From its own laboratory and field tests on the CW ballast, a large utility concluded;

1. "This ballast operates at normal current in locations where tanks on other ballasts have burst previously." (This is believed to have been caused by the greatly increased flow of harmonic current into the ballasts.)

2. "The ballast will enable lamps to provide constant light output over a wide range of supply voltage."

3. "The ballast will not cause undue lamp burnouts due to high wattage, since it allows even 140-150 volt lamps to draw little more than 400 watts."

4. "The ballast will not burn out as a consequence of lamp burnouts, since its open-circuit current is low."

5. "The ballast will start lamps at extremes of low temperature."

Other Advantages of the CW

Primary volt-amperes of the L-M CW are very uniform, compared to much wider fluctuations of other ballasts. Split primary winding permits connecting the CW to either 100-130 or 200-260 volts. Since the same CW ballast may be used for pole base, pole top or aerial applications, you stock only one ballast.

Isolated secondary winding permits grounding the secondary when desired.

Added features are that the L-M CW is galvanized, then painted. It has a watertight, moisture-proof seal. Neoprene-covered leads are brought out through tightly fitting neoprene plugs. The CW is 1 to 2 pounds lighter than other ballasts.

Get Complete Information

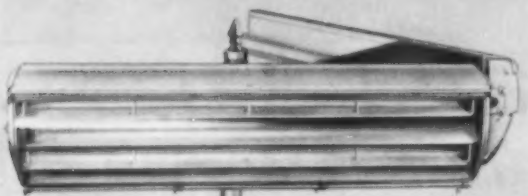
L-M makes a full line of incandescent, mercury vapor, and fluorescent luminaires, and offers you the benefits of its well-known Application Engineering Service. Ask the L-M Field Engineer for bulletins and information. Or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

LINE MATERIAL *Street Lighting*

Wide asymmetric distribution now available with fluorescent lighting for business districts, highways, and parking areas. Chart: Light distribution pattern for 4-lamp V-shape L-M fluorescent luminaire.

LINE MATERIAL Fluorescent Luminaire Installation Data

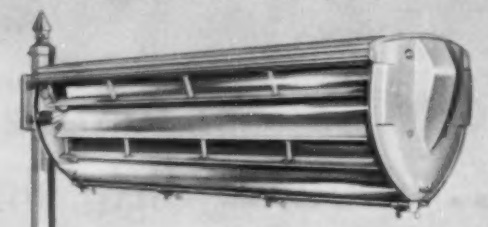
Average foot candles at 50° F. temp. in still air—25' mounting height. Illustrations below show L-M's various types of units and mountings, together with the average foot candles on the street with various spacings.



4-lamp V-shape fluorescent luminaire provides more even light distribution for wide streets.

4-Lamp V-shape Fluorescent Luminaire*

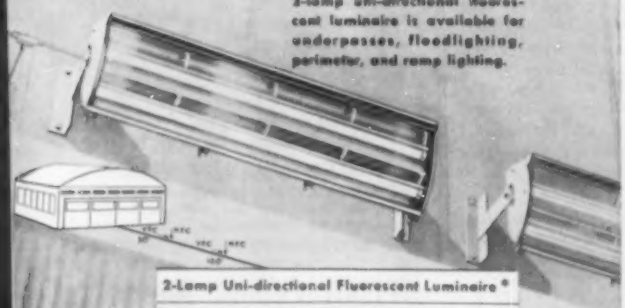
Spacing	Staggered 50' Street Width	Opposite 70' Street Width
75 ft.	1.75 A.F.C.	——
100	1.30	2.15 A.F.C.
125	1.05	1.90
150	0.85	1.45
175	——	1.25



4-lamp bi-directional fluorescent luminaire provides a broader light pattern for center parkway and area lighting.

4-Lamp Horizontal-mounted Fluorescent Luminaire*

Spacing	Center-Mounted Twin Arm 40' Road Twin Roadways	Staggered 50' Street Width	Opposite 70' Street Width
75 ft.	2.85 A.F.C.	1.35 A.F.C.	——
100	2.15	1.00	1.55 A.F.C.
125	1.70	0.80	1.26
150	1.40	0.65	1.05
175	1.20	——	0.90

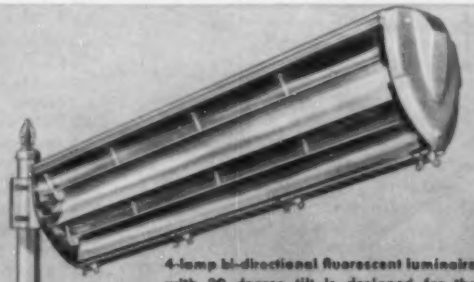


2-lamp uni-directional fluorescent luminaire is available for underpasses, floodlighting, perimeter, and ramp lighting.

2-Lamp Uni-directional Fluorescent Luminaire*

Readings were made of ramp installation consisting of ten 2-lamp uni-directional fluorescent luminaires. 22' mounting height—spaced 8' on center.

Dist. From Source	Vertical F.C.	Horizontal F.C.
50 ft.	9.70	6.50
100	2.40	1.20
150	1.10	0.35
200	0.65	0.05
250	0.40	——
300	0.25	——
350	0.20	——



4-lamp bi-directional fluorescent luminaire with 20 degree tilt is designed for the narrow street and entrance way.

4-Lamp Tilted Fluorescent Luminaire (20° Tilt)*

Spacing	Staggered 40' Street Width	Staggered 50' Street Width	Opposite 70' Street Width
75 ft.	1.50 A.F.C.	1.35 A.F.C.	——
100	1.15	1.05	1.60 A.F.C.
125	0.90	0.80	1.30
150	0.75	0.65	1.10
175	——	——	0.90

*From test reports E353-83, E353-817, E353-810, E353-88.

A Fluorescent Community is a Progressive Community. L-M fluorescent lighting means fewer accidents, less crime, more business.

L-M's New Fluorescent Street Lighting Luminaire Large Light Source, Minimum Glare

By **STACY STANDLEY**
Manager
Lighting Sales
Line Material Company

L-M's New Fluorescent Luminaire is a revolutionary improvement in street lighting. With its large light source the fluorescent luminaire produces an even, cool white color over a large area. Because of its large light source, it provides virtually glareless illumination.

Fluorescent luminaires provide a light that is particularly advantageous in business and shopping sections. The surrounding sidewalk area adjacent to the curb is illuminated and gradually fades out to make the background contrast as gradual as possible. This provides a wider scope of vision for both the motorist and the pedestrian, in addition to creating a cheerful and active atmosphere in the shopping area.

L-M's New Fluorescent Luminaires are available in these styles:

1 4-lamp V-shape for use on wide streets

2 4-lamp bi-directional tilted 20° toward the street for narrower streets and entrance ways

3 4-lamp bi-directional with level horizontal mounting for center parkway and area lighting

4 2-lamp uni-directional for underpass, flood lighting, perimeter and ramp lighting

The fluorescent lamp used in these luminaires has a rated lamp life of 7500 hours. This longer lamp life reduces the cost of relamping luminaires below any other type now used for street lighting.

Features of L-M's New Fluorescent Luminaires

Large light source • Even, cool white color • Minimum glare • Low power consumption • Longer lamp life

Separate efficient reflecting system for each lamp • Good vertical component across the whole surface of the street • Good balance between building and road surface

Two lamp ballasts • Easy accessibility for relamping • Wiring terminal block easily accessible • Ballast can be removed very simply • Bracket adjustable ±5° for leveling.

L-M's fluorescent luminaires are easily accessible for cleaning, relamping, wiring terminal block and ballast removal. Four-lamp unit has two ballasts with one tube on either side of the luminaire paired to each ballast. Thus, if one tube burns out, the light output of the luminaire is reduced only 50% in each direction. Also, if desired, two lamps could be switched off for part night circuits.

Get Complete Information

Details of the new L-M fluorescent luminaires are available. Ask the L-M Field Engineer for information, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL

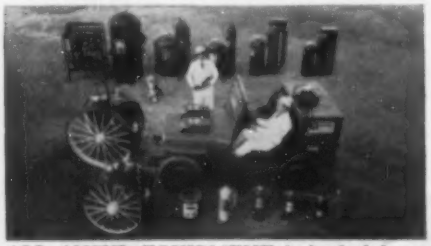
196R

Street Lighting

FIRE TRAINING SCHOOL. Here at Marinette your key plant personnel will receive special training in the proper use of every type of fire equipment. They will learn the basic techniques for fighting every kind of fire. This is the best equipped private fire training school in the nation.

There is no need to accept less than Ansul's complete fire protection program!

TRAINING DEMONSTRATIONS. Our fire fighting experts provide training in the use of Ansul equipment at your plant.



ALL ANSUL EQUIPMENT is backed by a five year warranty, your assurance of fast, effective fire protection.

Experience can be a grim teacher. It has taught many a businessman that you need a *complete* fire protection program to guard against ruinous fire damage. You need *fast, effective equipment,* plus *trained personnel* to man that equipment. Ansul offers *both* and at no extra cost. Get in touch with the Ansul man, he has the story about *complete* fire protection.

Call the Ansul Man!

Get in touch with your local Ansul man through the "yellow pages" or write ANSUL CHEMICAL COMPANY, Dept. F-152, Fire Equipment Division, Marinette, Wisc. Write Ansul for your copy of new Fire Equipment Catalog.

ANSUL

A *Modern* AUTOTRANSFORMER STARTER

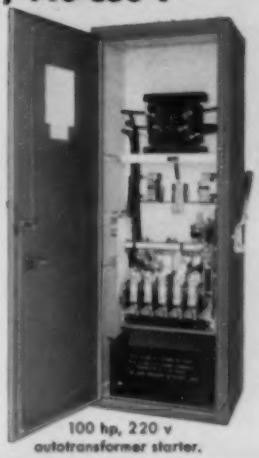
with Air Break Contacts up to 75 HP, 220 V; 150 HP, 440-550 V

Think of it! Air break, silver alloy contacts . . . no messy oil to bother with. The contacts stay in good condition without filing, cleaning, or dressing. This air break feature, alone, makes this Bulletin 646 starter the most up-to-date, manually operated, autotransformer starter on the market.

Air break contacts are standard for Sizes A, B, and C starters, but these starters can be furnished with oil-immersed contacts, where operating conditions require them. Only the Size D starter, rated up to 250 hp, uses oil immersed contacts. Write for Bulletin 646.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Ltd., Galt, Ont.

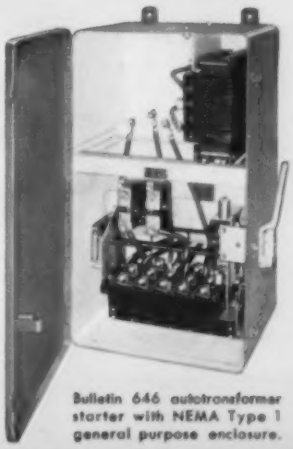


100 hp, 220 v autotransformer starter.

OVERLOAD PROTECTION—The Bulletin 646 autotransformer starter has two Bulletin 816 automatic reset thermal overload relays that assure dependable overload protection.

NO-VOLTAGE RELEASE—The starter contacts are held in the RUN position by a solenoid latch, which drops out if the line voltage fails and opens the starter contacts. The motor cannot restart, when line voltage is restored, unless the starter is operated through the starting cycle.

TIME DELAY DASH POT—The adjustable dash pot can be set for 0 to 15 seconds.



Bulletin 646 autotransformer starter with NEMA Type 1 general purpose enclosure.

SIGNAL BELL—A bell indicates when the starting lever is to be pushed into the RUN position. This feature removes the starting interval of the motor from the operator's judgment. Correct starting for existing line and motor conditions is the result.

AUTOTRANSFORMER—The open Delta-connected 3-phase autotransformer has 50%, 65%, and 80% reduced voltage taps. The starting voltage, therefore, can be easily adjusted to suit the load.

ALLEN-BRADLEY
QUALITY
BULLETIN 646 AUTOTRANSFORMER STARTER

A-B Quality

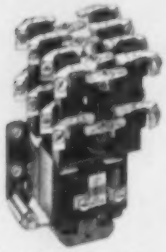
7-55-M

QUALITY RELAYS

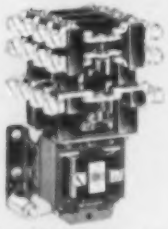
for Long, Trouble Free Service in Critical Control Circuits

Type C-200 A-C 2-pole relay

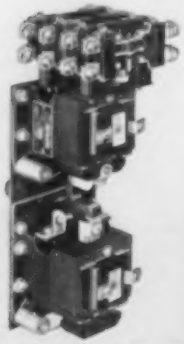
Type B-400 normally open 4-pole relay



Type B-800 normally open 8-pole relay



Type BX-840 universal 8-pole relay



Type BXL-440 universal relay with latch

Type BX-44 Universal 4-pole relay in NEMA Type 1 general purpose enclosure. To change from N.O. to N.C. contacts, or vice versa, just change terminal connections. Max rating—10 amperes.

Here is a line of small relays that is ruggedly built for tough industrial service. The simple solenoid design... with ONLY ONE MOVING PART... guarantees millions of failure free switching operations. The double break, silver alloy contacts need no cleaning, filing, or other maintenance. For complete Allen-Bradley relay data, please write for Bulletin 700.

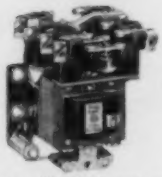
Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Ltd., Galt, Ont.

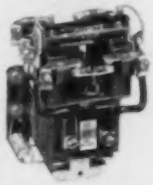
ALLEN-BRADLEY
BULLETIN 700 RELAYS
QUALITY

Type EX-440 D-C universal relay

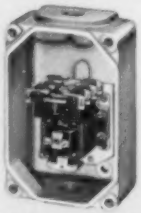
Type BX-220 universal 2-pole relay



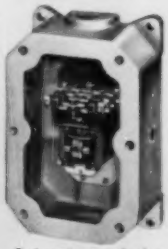
Type BM-200 mechanically held relay



Type BA-20 2-pole thermostat relay



Relay in watertight enclosure



Relay in explosion-proof enclosure

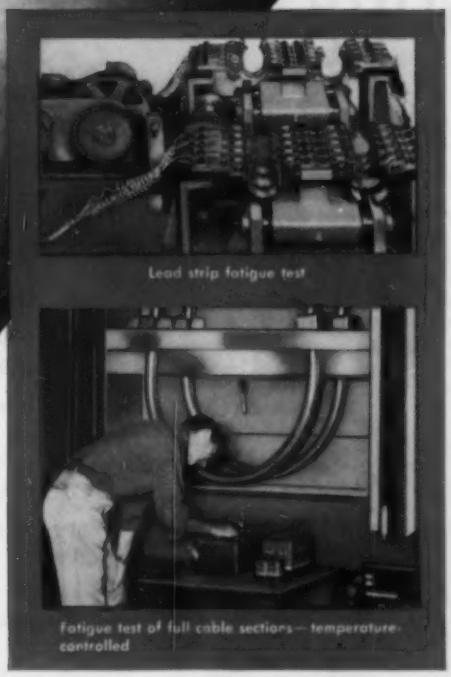
7-55-MB

ROEBLING PAPER POWER CABLE WITH TELLURIUM LEAD ALLOY SHEATH

TELLURIUM LEAD ALLOY SHEATHS MEET ALL REQUIREMENTS FOR FATIGUE RESISTANCE

TODAY'S HIGHER TEMPERATURES and increased loads are power cable problems met most satisfactorily and economically by Roebling Tellurium Lead Alloy Sheath. This sheath has absolutely top fatigue resistance; gives vastly increased service life despite severe bending stresses and cable movement during load cycles. Furthermore, Roebling Tellurium Lead Alloy has outstanding stability under heat—high temperature incurred at joints, terminations and in duct splicing cause no grain growth or physical impairment.

Roebling is unmatched in the breadth of its experience with Tellurium Lead Alloy Sheath and in the volume of cable it has produced with this remarkable sheathing. We will welcome the opportunity to send you Bulletin 205-B containing technical data on Roebling Tellurium Alloy Sheaths.



Lead strip fatigue test

Fatigue test of full cable sections—temperature-controlled

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

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Need Testing Help?

You may find your answer here, because **Testing for Industry** has been our business for nearly 60 years. We have excellent equipment and competent, thorough, experienced men who know how to use it.

You may use our talent and facilities to supplement your own effort, or for a complete testing program. In either case, the service is independent, impartial, and as confidential as your own.

We can determine properties, characteristics, and performance of the materials, apparatus, or components you use or produce — in the following fields:

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Using E.T.L. services is like finding extra trained talent and extra test equipment without adding to your payroll or capital investment.

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CHEMICAL • ELECTRICAL • ELECTRONIC
PHYSICAL • MECHANICAL • ENVIRONMENTAL

TESTING • INSPECTION
CERTIFICATION

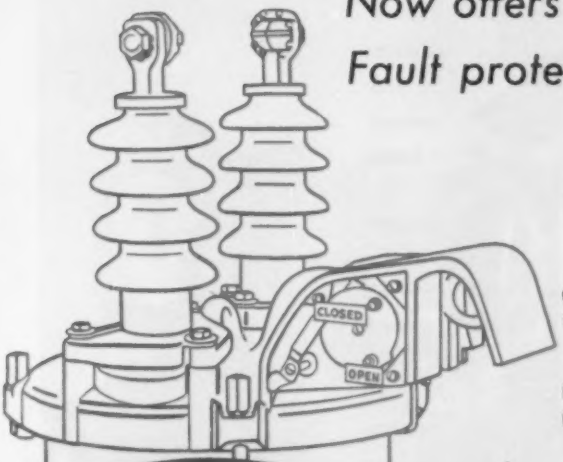
INCLUDING INFRARED SPECTROSCOPY, PHOTOMETRY, RADIOMETRY, SPECTROPHOTOMETRY AND PHOTOMICROGRAPHY

R&IE

Type MB-2 .. the All New

AUTOMATIC CIRCUIT RECLOSER

Now offers much greater Temporary Fault protection - 3 exclusive ways —



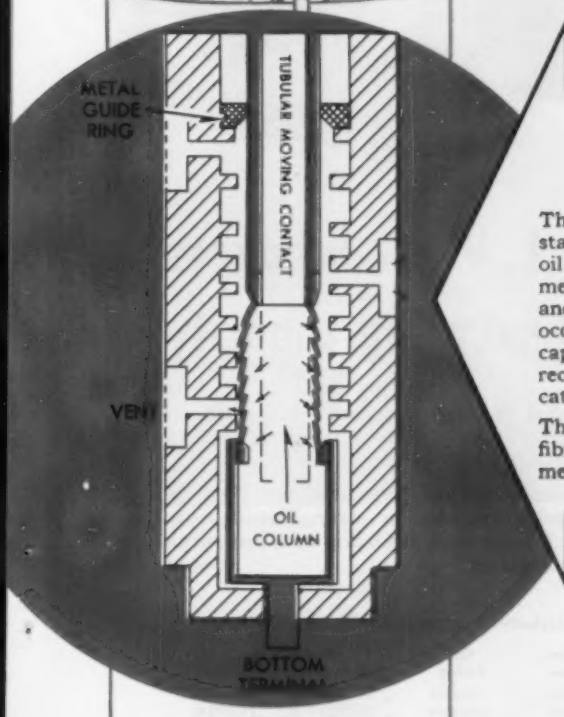
1 **FASTEST INTERRUPTION** of any Recloser—1 cycle

2 **FASTEST RESTORATION** of any Recloser—20 cycles

3 **NEW INTERRUPTION PRINCIPLE**—the

SC-OC

SINGLE CONTACT—OIL COLUMN



INTERRUPTER CHAMBER SECTIONAL VIEW

Showing tubular moving contact at half way point in operating travel—arc is at highest intensity, about to separate.

The Single, Tubular Contact, during operation, moves off the stationary Column of Oil, progressively exposing cool, clean oil to the area where arcing occurs. This arc-quenching method, in conjunction with the interrupting pressure chamber and the radial vents, is so highly effective that interruption occurs in the first half-cycle. Tests prove that it is more than capable of handling both high and low fault currents, and the recovery voltages encountered in any of its intended applications.

This new interrupting principle requires no fibre-to-metal or fibre-to-fibre assemblies—thus eliminating any possibility of mechanical interference resulting from moisture-swollen fibre.

Interrupting Capacities

Continuous Current Rating—Amperes	Amperes, RMS Symmetrical at System Voltages of— 4.8 Kv.	7.2 & 14.4 Kv.
100	6000	4000
140	6000	4000
200	6000	4000
280	6000	4000

Write for Bulletin No. 1550B

●

R&IE EQUIPMENT DIVISION

I-T-E Circuit Breaker Co.

GREENSBURG, PENNA.

STRUCTURES—steel or aluminum ● TESTING DEVICES ● KIRK KEY INTERLOCK SYSTEMS ● ISOLATED PHASE BUS STRUCTURES ● INTERRUPTER SWITCHES

INDOOR BUS SUPPORTS and BUS FABRICATION ● OUTDOOR BUS SUPPORTS and AIR SWITCHES ● SUBSTATION

Mr. W. T. Pyle displays the new, compact Westinghouse DB breakers now rated to a maximum of 150,000 amps.

NEW exclusive functions in L. V. air breakers now up to 15,000 amps interrupting capacity

Three new design developments make Westinghouse L. V. circuit breakers the most versatile, the most useful you can buy.

1. Two new ratings—the DB-75 and DB-100—provide you now with a complete line.
2. Interrupting ratings on all frame sizes have been increased on 240-volt and 480-volt nonselective applications to a maximum of 150,000 amps for the DB-100 at 240-volt.
3. The entire line of DB breakers is equipped with the new air-delayed overload tripping device with a unique range of adjustability, giving you new application opportunities—standard instantaneous and long-time-delay characteristics with a *total of 9 calibrated settings*, or, selective tripping units with numerous combinations of long- and short-time delay, *totaling 13 settings.*

There's more to the story—call your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60885

Nonselective Application Ratings for DB Breakers

Frame Size	Old Rating	New Rating 240 volts	New Rating 480 volts
DB-15	15,000A	30,000A	25,000A
DB-25	25,000A	50,000A	35,000A
DB-50	50,000A	75,000A	60,000A
DB-75	75,000A	100,000A	75,000A
DB-100	100,000A	150,000A	100,000A

YOU CAN BE SURE...IF IT'S Westinghouse

STERLING SILVER CHRISTENING BOWL BY REED AND BARTON

AUDITED PAID CIRCULATION ABC

ON **Electrical World**

25,101 PAID CIRCULATION, 6/30/55

NEW

SPRAGUE MODEL 400 INTERFERENCE LOCATOR

PORTABLE, VERSATILE SPRAGUE UNIT PINPOINTS SOURCE OF INTERFERENCE

This newly improved Sprague instrument is an extremely lightweight, compact, rugged and sensitive interference locator—*with the widest frequency range of any standard available unit!*

The Sprague 400 is engineered and designed for entirely practical, easy-to-operate field use. It is particularly keyed to the needs of the utility industry—an economical instrument that permits rapid pinpointing of interference sources by linemen and trouble shooters.

The Sprague 400 operates across the entire standard and FM broadcast, shortwave and VHF-TV spectrums. In field use it operates from a self-contained storage battery or from 117 volt a-c lines. A built-in battery charger is an additional feature of the Model 400.

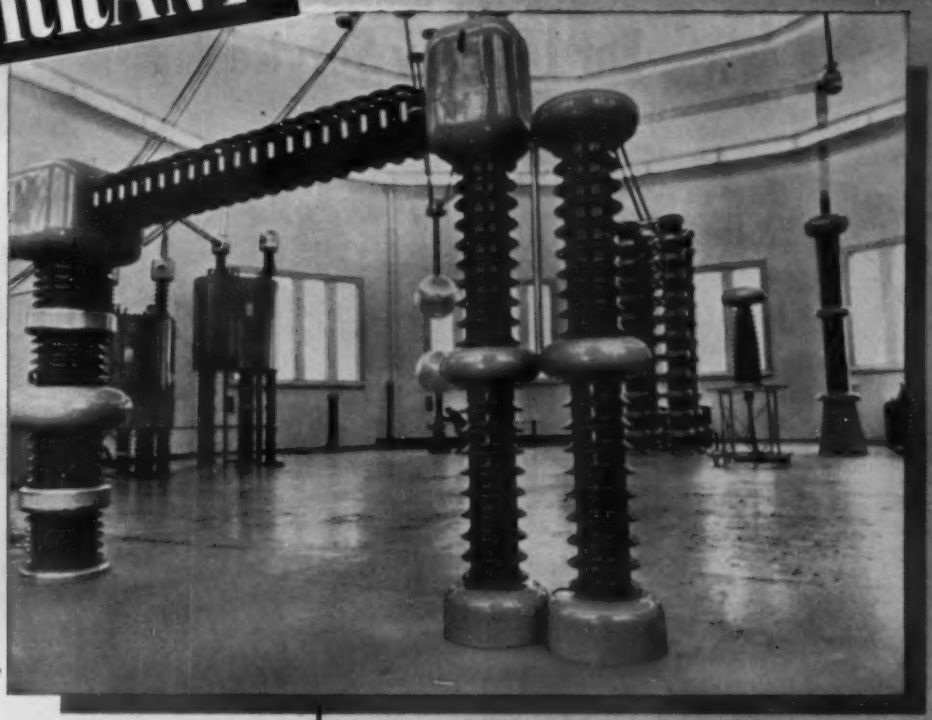
SEND FOR BROCHURE "THE SPRAGUE MODEL 400 INTERFERENCE LOCATOR"

SPRAGUE ELECTRIC COMPANY

315 MARSHALL STREET · NORTH ADAMS, MASS.

FERRANTI

HIGH VOLTAGE TESTING EQUIPMENT



IN NORWAY

The Testing Equipment illustrated has been supplied by Ferranti Ltd to the Research Laboratory of Standard Telefon og Kabelfabrik A/S, Oslo, Norway. It consists of :

Foreground : 1,000,000 volt D.C. Testing Equipment.

Left . 600 kV, 1,200 kVA , A.C. Testing Equipment.

Background : 12 Stage 2,000,000 volt Impulse Generator.

A 1,500 mm sphere gap and surge potentiometer can also be seen in the background.

TRANSFORMER CAPACITY OF OVER 5,000,000 kVA PER ANNUM

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

FERRANTI LTD. Head Office and Plant : HOLLINWOOD · LANCASHIRE · ENGLAND

PLANTS AND OFFICES

NEW YORK : Ferranti Electric Inc., 30 Rockefeller Plaza, New York 20, N.Y.

TORONTO : Ferranti Electric Ltd., Mount Dennis, Toronto 15, Ontario.

MANCHESTER, ENGLAND : Ferranti Ltd. Moston, Manchester 10.

EDINBURGH, SCOTLAND : Ferranti Ltd., Ferry Road, Edinburgh 5.

For 14.4-Kv Service ... Tank-

ROOMY OPERATOR CABINET. Access to operator is unrestricted. Relays when specified are in separate cabinet which can be secured against unauthorized personnel. Operator is high speed solenoid type—mechanically and electrically trip-free. Side hinging of L-shaped doors allows access to operator cabinet from three sides. Only 7 inches of clearance in front of cabinet needed to open doors.

BREAKER RATINGS (8-Cycle Standard Interrupting Time)

Type	Rated Kv	Rated Amps	INTERRUPTING RATING			Weight of Breaker With Oil (lbs)
			RMS TOTAL AMPERES		Kva	
			At Rated Volts	Maximum Rating		
OZ-15-100	14.4	600	4,000	15,000	100,000	2,350
OZ-15-250	14.4	600	10,000	25,000	250,000	2,370
OZ-15-250	14.4	1200	10,000	25,000	250,000	2,470
OZ-23-250	23	600	6,300	12,000	250,000	2,370

A-C ALLIS-CHALMERS

ALLIS-

Per-Phase Design

in addition, breaker sets high standards of operating convenience

Compare this breaker with any other in its class. Note the clean design; the uncluttered operator cabinet; the accessibility to all component parts. Check the features shown below. Then, GET COMPLETE INFORMATION! Call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

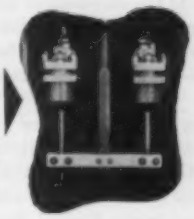
A-4254

VISIBILITY PLUS — external position indicator easily visible at a distance from front or side. Contact position indicator also provided inside cabinet. In addition, maintenance closing device is side operated. Man closing breaker can observe contacts and man working on them.

RELAYS — when specified, are in separate cabinet from operator. Whether you operate the breaker — slam the door — or let the wind slam it, relay contacts will not operate accidentally. Relay panel is fixed and shock-mounted at four points. Troublesome hinge wiring eliminated. Separate door in rear of cabinet provides access to back of relays.

NO BURIED LEADS. No more conduits, pipes and fittings! To get at bushing current transformer leads, simply remove 3 pins at bottom of fabricated wiring duct and remove bottom plate. This is typical of the well-engineered features that make this breaker outstanding in its field.

DOUBLE BREAK per phase principle is used with time-proved *Ruptor* interrupting devices. Self-wiping, self-aligning tulip and bayonet contacts are used. Here again, Allis-Chalmers provides the same quality construction as is used on large A-C breakers.



Ruptor is an Allis-Chalmers trademark.

TANK-PER-PHASE construction — as used in large breakers—has high safety factor. It completely isolates phases and eliminates internal phase-to-phase flashover. A maximum of 12 gallons of oil in each tank makes it a simple matter to raise and lower tanks.

CHALMERS

FEDERAL MICROWAVE—"CERTIFIED BY A WORLD OF RESEARCH"

Communication that's so right for right-of-way companies

Why is microwave communication so economical? The main reason is: it is *physically discontinuous!*

Between antennas... tens of miles apart... no legal right-of-way must be negotiated and purchased... no pole-line raised... no wires strung. Microwave installations made throughout the world by companies of International Telelphone and Telegraph Corporation prove these facts to be of major importance... especially where circuits must traverse cities, rivers, bays, swamps, deserts, jungles, and mountain ranges.

Matching the rightness of microwave for right-of-way companies is the simplicity, flexibility, versatility, and dependability of *Federal* Microwave... developed cooperatively by IT&T microwave specialists in 10 countries and proved-in by installations in the United States and 16 countries around the globe.

Today, pipelines, power utilities, railroads, airlines, telephone, and other right-of-way companies... whatever their circuit requirements... can look with confidence to the quality and performance of *Federal* Microwave... the system that's *"Certified by a World of Research!"*

Federal

A DIVISION OF IT&T

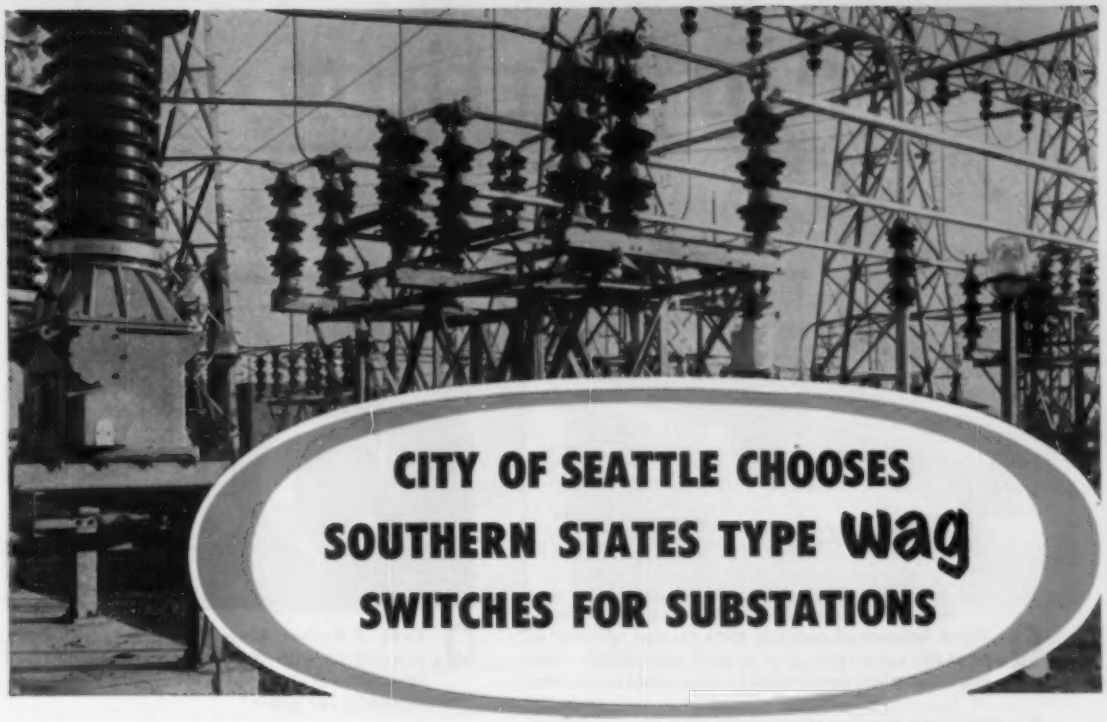
Federal Telephone and Radio Company

A Division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

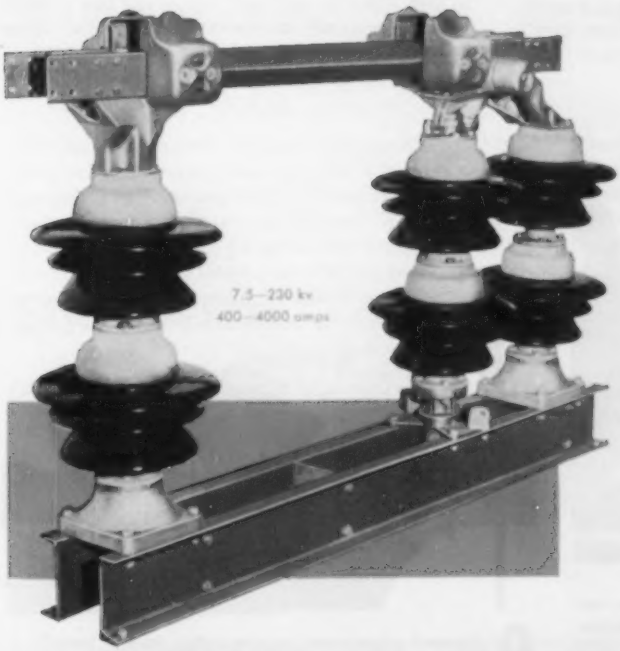
100 KINGSLAND ROAD • CLIFTON, NEW JERSEY

In Canada: Standard Telephones and Cables Mfg. Co. (Canada) Ltd., Montreal, P. Q.

Export Distributors: International Standard Electric Corp., 67 Broad St., New York



CITY OF SEATTLE CHOOSES SOUTHERN STATES TYPE WAG SWITCHES FOR SUBSTATIONS



One of the nation's leading municipals, the City of Seattle, Department of Lighting, last year equipped its Shoreline Substation with twelve 115 kv - 1200 amp WAG switches. Recently, forty 34.5 kv - 1200 amp WAGs and two each of 3,000 and 4,000 amps were installed at the Duwamish Substation in South Seattle.

Today, extra care must be given to the choice of air break switches, because increased generating capacity and a higher degree of integration bring corresponding increases in short circuit capacities.

The Type WAG is designed to carry full-rated continuous current indefinitely and to withstand maximum short circuits. Self-cleaning, high pressure line contacts with greater deflection, shuntless design, and simplified mechanical linkage assure adequate performance—even under the most adverse conditions, including icing.

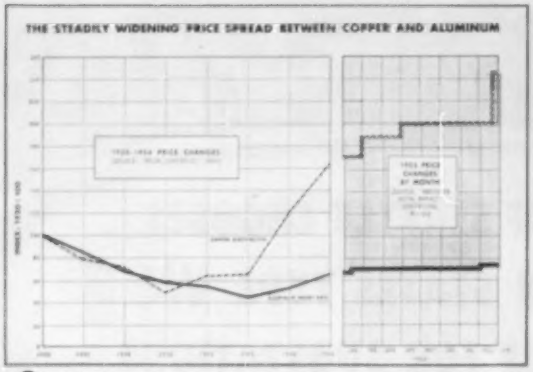
Other features that cause increasing numbers of utilities to use Type WAG Switches are: double-race, greaseless bronze ball bearings; oilite sleeve bearings; simplified design; no maintenance; and rugged, high-quality construction throughout.

Careful study will show why it will pay you to use Type WAG Switches. For additional details, write us for Bulletin 390-R.

SS **SOUTHERN STATES EQUIPMENT CORP.**
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

Important quiz



Q. What happened recently that caused utilities all over the country to give urgent attention to making a complete conversion to aluminum conductor?

Another copper price increase! Chart above shows the *continually widening* price spread between copper and aluminum. Even *before* the latest increase in copper prices, utilities saved thousands of dollars a year by changing to Kaiser Aluminum conductor. Now, they'll save even more!

Q. Even if Kaiser Aluminum conductor does provide us with some savings, shouldn't we stick with the copper we've been using successfully for years?

You probably should . . . *if* "some savings" were all you could get. But aluminum is now from 43% to 55% lower in cost than copper per foot of wire! From an economy standpoint, you can't use copper "successfully" with a cost differential like that!

Q. If we convert to aluminum, we have to train our linemen in new techniques—and that costs money.

In practice, training costs are negligible. Utilities say that after only a few days' instruction, most linemen *prefer* aluminum. Prefer it so much, in fact, that it's often difficult to deplete remaining copper inventories!

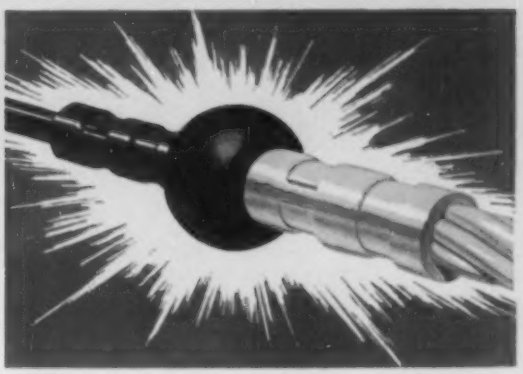
Q. Doesn't aluminum require extra care in handling and thus cost more to install?

Aluminum must be handled exactly as copper *should* be handled. Utilities and contractors tell us that installation costs for aluminum are *consistently* lower than for equivalent copper.

for utility men!

Q. Who'll help us when we convert to aluminum?

Tomorrow, if you wish, Kaiser Aluminum field men will give you the same alert, expert service that's the talk of the industry! They'll work hand-in-hand with your crews on stringing jobs; demonstrate ways to speed installations and cut costs.



Q. But what about the problem of connecting aluminum to our existing copper lines?

The fact is this: when recommended installation procedures are followed, there is no problem. New connector designs are now available that permit aluminum-to-copper connections in *any* area, under *all* conditions—and with little danger of future failures. You should consult Kaiser Aluminum engineers and field men when you think you may have a problem.

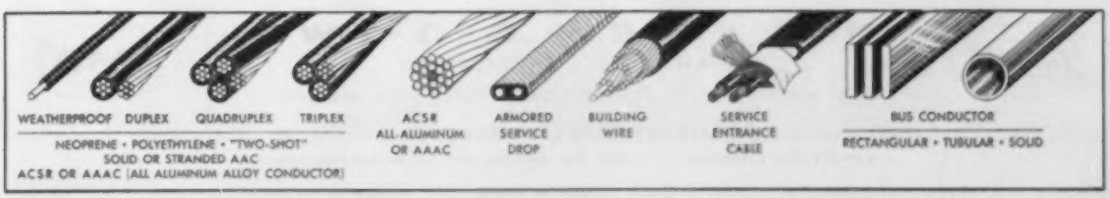
WHEN you convert to Kaiser Aluminum conductor you get unsurpassed services. We'll furnish detailed technical information such as stringing sag tables and sag-and-tension charts on request. We'll work with you in power system planning and design. We'll keep you up to date on latest construction techniques and help you solve specific installation problems. We'll give you the *best* distributor service in the country.

Prove to yourself—with your next order—that Kaiser Aluminum service is the kind of service you've been looking for! For immediate attention, contact the Kaiser Aluminum sales office listed in your telephone directory or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

If you're looking for action . . . think of . . .

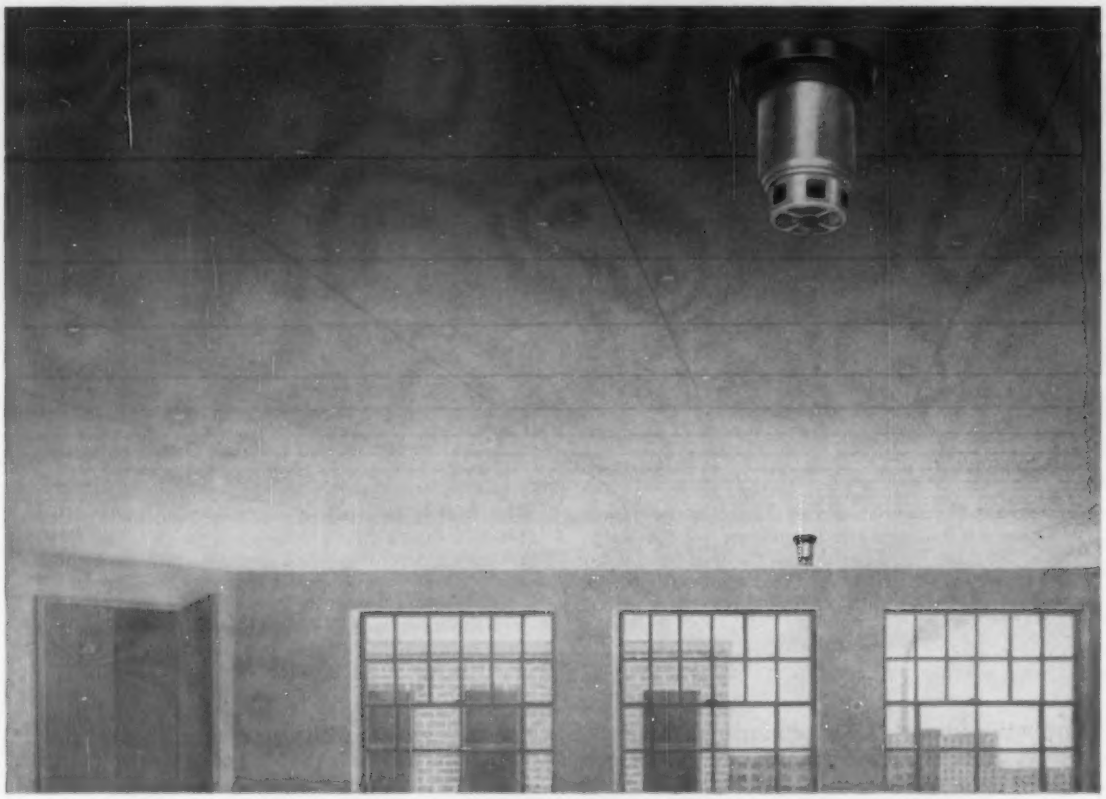
Kaiser Aluminum

KAISER ALUMINUM & CHEMICAL WIRE



New, radio-active, automatic fire guard!

C-O-TWO PRE-DETECTOR SYSTEM



Each pre-detector head protects up to 3,600 square feet of area . . . harmless radio-active element utilizing ionization chamber principle quickly detects all forms of fire . . . requires only simple two-wire circuit and insignificant wall space for controls.

This completely new and positive means of spotting fire is just what you've always needed and wanted . . . detects in the earliest stage, invisible combustion gases, visible smoke, slow smoldering, as well as open flame. The C-O-TWO Pre-Detector System is simple to install, extremely economical to maintain and doesn't depend on thick smoke or heat for actuation.

As many pre-detector heads as necessary can be connected together in a single circuit and up to 16 separate circuits or spaces handled by one system. With a single circuit the pre-detector heads are connected directly to the fire indicating cabinet, while with multiple circuits the pre-detector heads are first connected to one or more space indicating cabinets capable of visually showing by number the exact location of the fire. Relays perform such functions as sounding alarms, closing fire doors, shutting down ventilation and releasing fire extinguishing systems.

The C-O-TWO Pre-Detector System has been subjected to extensive testing and carries Underwriters' Laboratories, Inc. listing, as well as Factory Mutual Laboratories approval. Proven pilot installations have been made in such diversified properties as a television station, an electric power company network analyzer room, a railroad signal tower, an airline flight training equipment room and the offices of an insurance company.

Don't take unnecessary chances any longer . . . the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts about this new C-O-TWO Pre-Detector System today!

Pyrene

PYRENE — C-O-TWO

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Sales and Service in the Principal Cities of United States and Canada

C-O-TWO

COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM

For cost conscious engineers...

Unique adaptability of Sangamo Type R Current Transformer encourages simple, economical installations

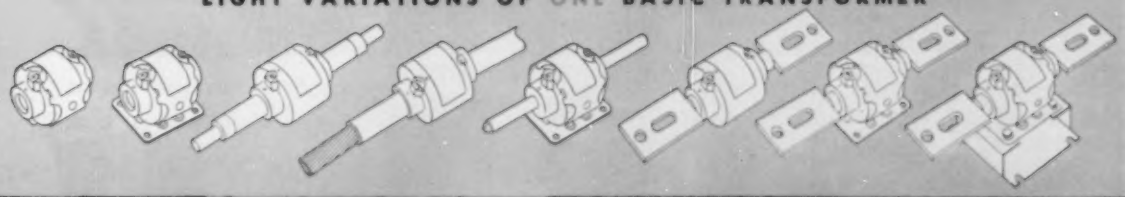
Use this Sangamo (Type R) Current Transformer as a bar-primary-type, a window-type, with or without an auxiliary mounting plate.

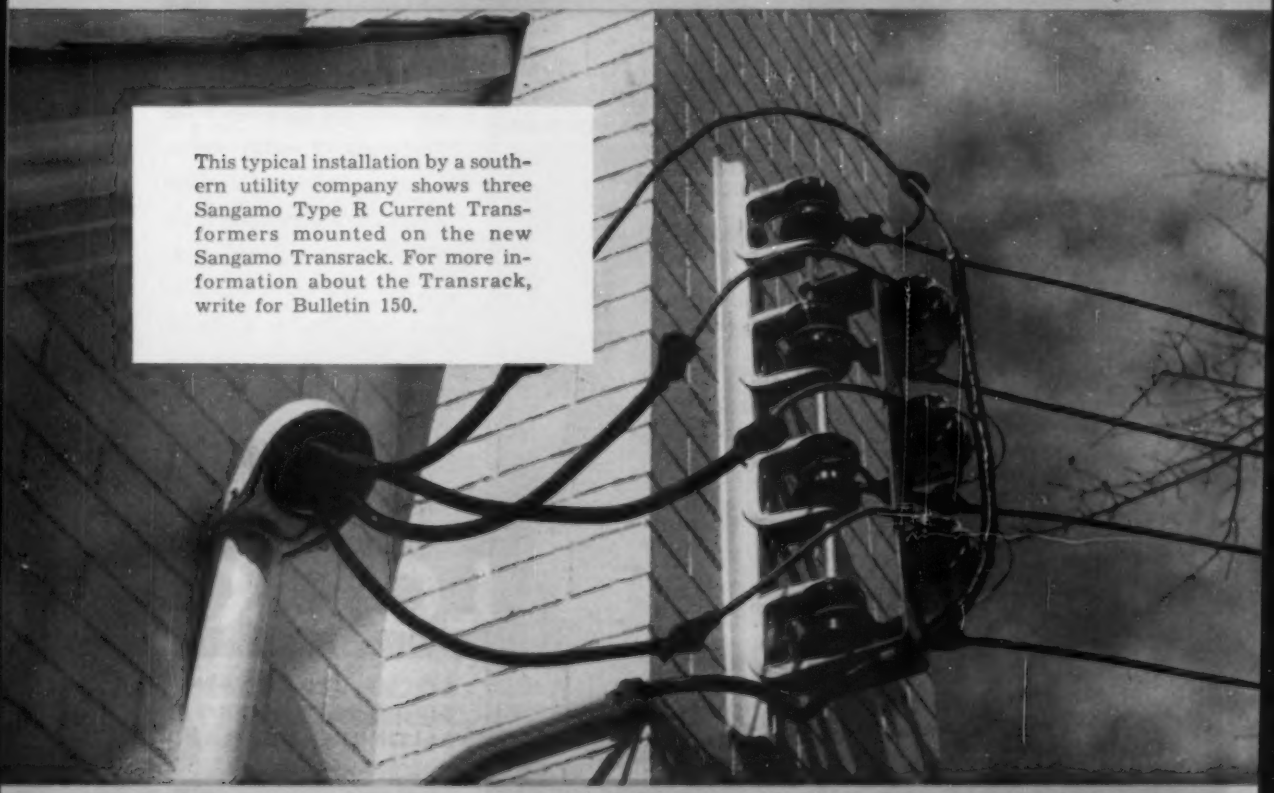
The Type R is light enough to be supported by the primary conductor only.

Type R's are encased in a high impact, phenolic shell, filled with a thermo-setting plastic that eliminates voids and prevents moisture from reaching core or windings.

Full information is given in Bulletin 501... be sure to write for your copy today.

EIGHT VARIATIONS OF ONE BASIC TRANSFORMER





This typical installation by a southern utility company shows three Sangamo Type R Current Transformers mounted on the new Sangamo Transrack. For more information about the Transrack, write for Bulletin 150.

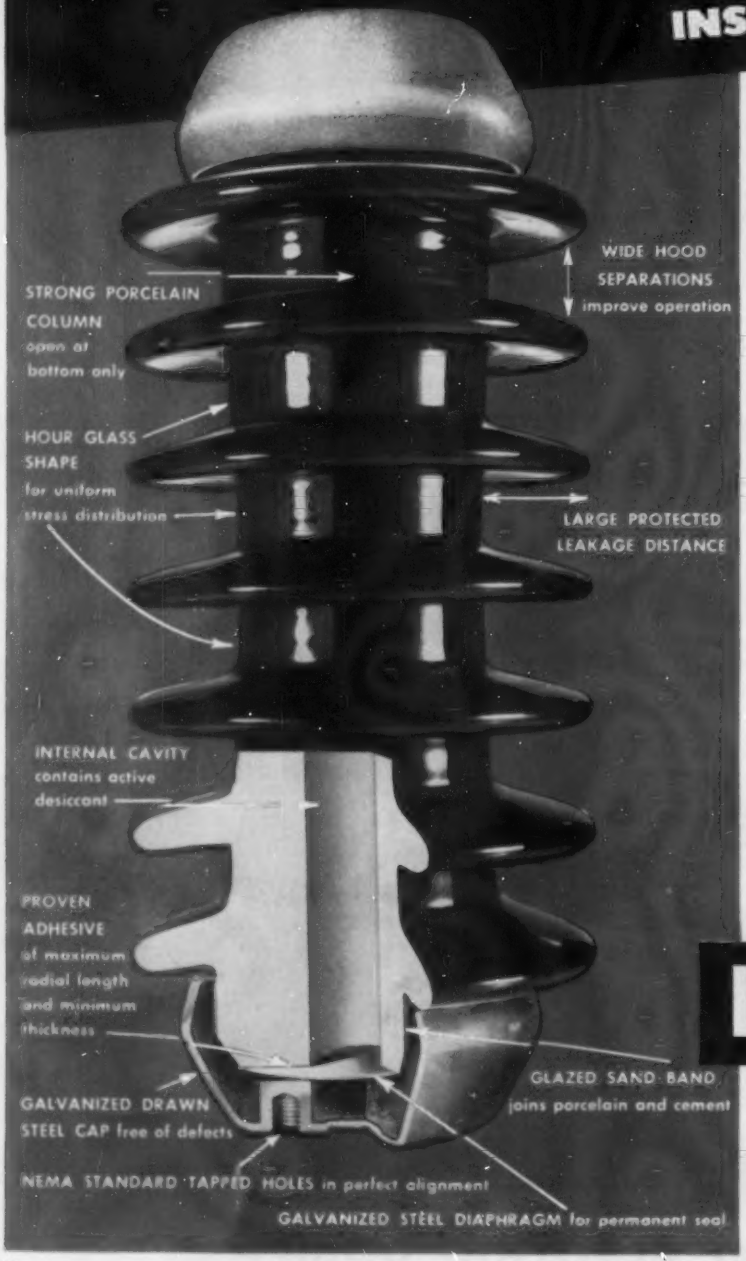
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

NEW ADDITION TO LOCKE LINE OF APPARATUS INSULATORS

LOCKE'S NEW STATION POST

SWITCH & BUS INSULATOR


WIDE HOOD SEPARATIONS improve operation
STRONG PORCELAIN COLUMN open at bottom only
HOUR GLASS SHAPE for uniform stress distribution
LARGE PROTECTED LEAKAGE DISTANCE
INTERNAL CAVITY contains active desiccant
PROVEN ADHESIVE at maximum radial length and minimum thickness
GLAZED SAND BAND joins porcelain and cement
GALVANIZED DRAWN STEEL CAP free of defects
NEMA STANDARD TAPPED HOLES in perfect alignment
GALVANIZED STEEL DIAPHRAGM for permanent seal

While you may prefer regular Cap and Pin type Switch and Bus insulators . . . you may be one of those who also use Station Post apparatus insulators. If so, here's a new Station Post especially designed to reduce corona and radio interference . . . particularly where industrial contamination and fog tend to lessen effectiveness of earlier station post designs. Modern design features of this new Station Post are shown by cutaway photo at left . . . but these are described in much more detail in a separate brochure . . . LA106. Ask your Locke representative for a copy . . . or write direct.

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

GREEN

FOR FIFTY YEARS

Specialists

IN IMPORTANT STEAM PLANT EQUIPMENT

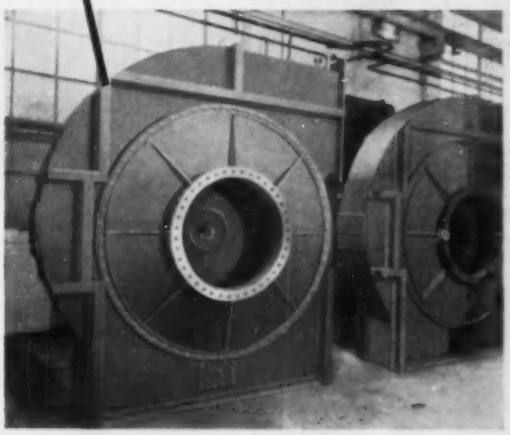
Complementing our several designs of GALEX Airfoil Type Draft Fan recently described is an extensive line of various types of fans with forwardly curved, straight radial, or backwardly curved blades. Thus, we are in position to offer soundly engineered fans for any draft requirement. The GALEX Fan, introduced by us in this country back in 1916, has been modernized and broadened in application particularly to take care of the more selective pressure-volume combinations required by today's boiler plant operations.

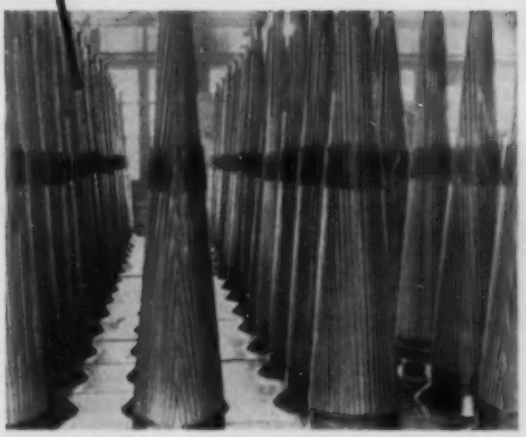
For problems of Fly Ash Control, we offer the Aerodyne Collector which is producing exceptionally gratifying results in some of the largest utilities in the country. Because of its positioning flexibility and adaptability to existing flue systems we suggest that you consider its use in connection with your fly ash problem.

Yes, on Draft Fans and Fly Ash Collectors, we are in a strong position to help you take care of your requirements . . . with plenty of experience to back up our recommendations.

FORCED AND INDUCED DRAFT FANS

FLY ASH AND DUST COLLECTORS





GREEN

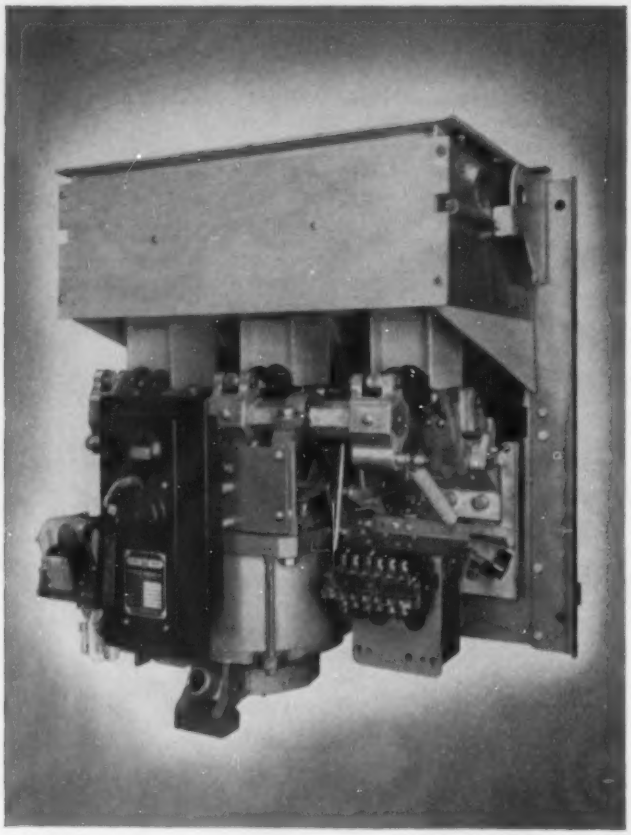
POWER AND PROCESS PLANT EQUIPMENT

GREEN THE AIRFOIL TYPE FAN Galex FAN

NEW YORK • CHICAGO • DETROIT
Representatives in Principal Cities

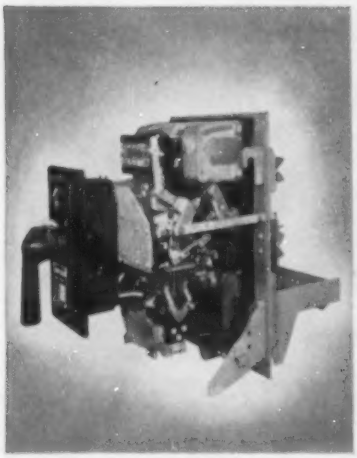
FUEL ECONOMIZER COMPANY,
BEACON 3, NEW YORK

News of new developments in

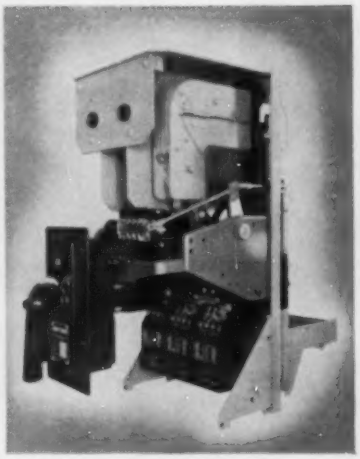


K line of circuit breakers now made through 3000 amp continuous, 75,000 amp interrupting at 600 v a-c

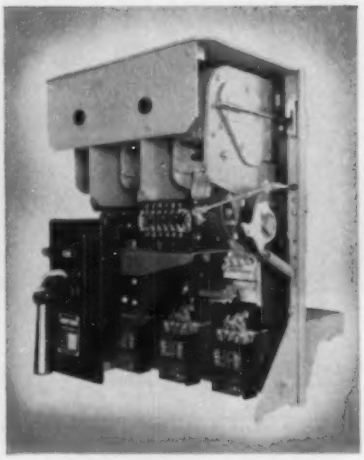
The new Type KD Air Circuit Breaker extends I-T-E's established three-high line of K breakers. It is an extremely compact metal panel breaker which incorporates the proved performance and generous safety factor of the KA, KB and KC breakers. As an integral part of I-T-E switchboard design, it offers the additional advantage of accessibility in minimum space.



KA Circuit Breaker



KB Circuit Breaker

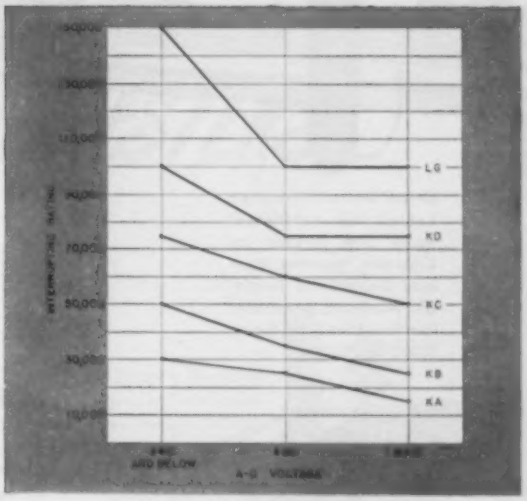


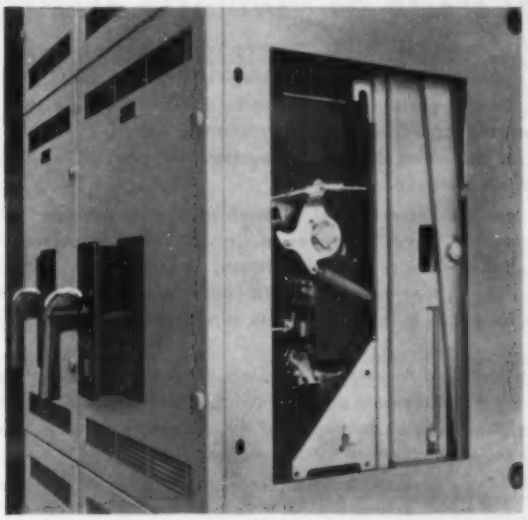
KC Circuit Breaker

I-T-E Low Voltage Switchgear

Circuit breaker interrupting ratings increased in keeping with proposed industry standards

You save, because these standards reduce switchgear costs by permitting the use of lower interrupting rating breakers for short circuit protection in 240 v a-c and 480 v a-c systems. And with smaller breakers you save space, too. Uprating of I-T-E Types KA, KB, KC, KD and LG Air Circuit Breakers is shown in the accompanying chart.





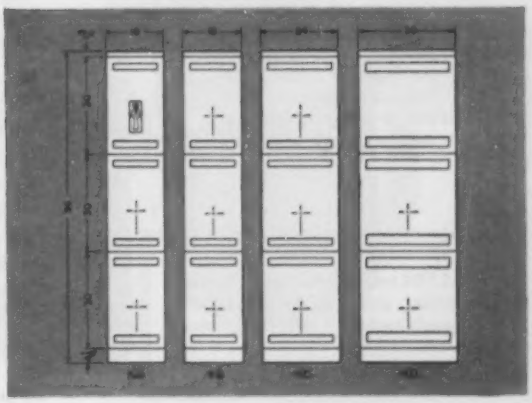
Test position with doors closed now standard on new switchgear

Test position with no increase in over-all switchgear depth! This facility is by far the most convenient, most compact design on the market. It is an exclusive with I-T-E Switchgear, yet it costs no more. Additional advantages are increased safety, reduced maintenance, improved cleanliness, easier circuit identification.

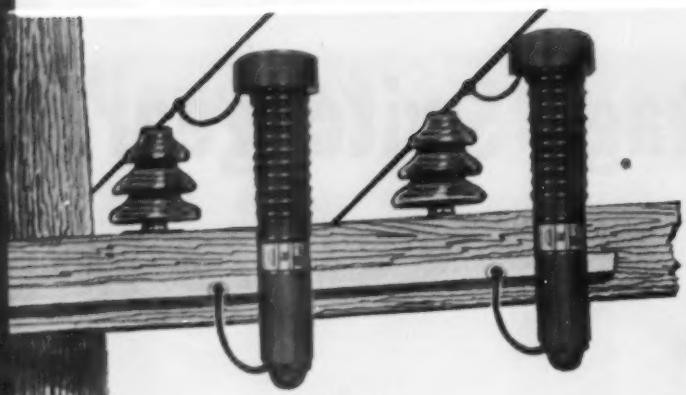
New compact breaker design saves space

All I-T-E Type K Circuit Breakers can now be assembled three-high. KA, KB and KC frame widths remain the same as before. However, the new KD breaker is 6 in. narrower than the old LG frame, and can be arranged in a three-high compartment, space being thus provided for instrumentation in the same frame.

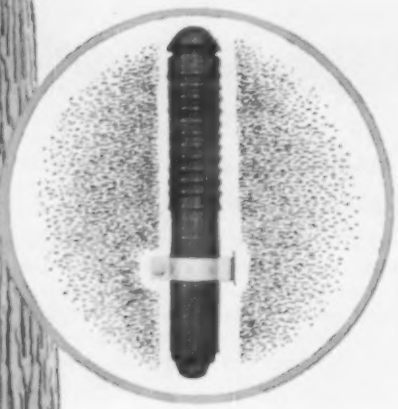
For complete information, contact your nearest I-T-E field office. Or write I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.



I-T-E CIRCUIT BREAKER COMPANY · Switchgear Division



Crystal Valve All-Porcelain Sealed (Non-ventilated) Spark Gap Arrester for Cross-arm Mounting. Line-lead Ground-stud Terminals. Maximum permissible line-to-ground voltages, 3,000 to 18,000.



Crystal Valve All-Porcelain Ventilated Spark Gap Arrester for Cross-arm Mounting. Line-stud Ground-stud Terminals. Maximum permissible line-to-ground voltages, 3,000 to 18,000.

WRITE FOR helpful data folder "Proved Protection," giving all the inside facts you should consider in selecting lightning arresters.

YOU HAVE A CRYSTAL VALVE

1 CROSS-ARM MOUNTING

FOR CV SEALED OR VENTILATED ARRESTERS

Choice of mounting is only one advantage of Crystal Valve Lightning Arresters. Most important advantages to distribution engineers are greatly reduced operating and maintenance costs . . . increased efficiency of the entire distribution system . . . negligible outages during lightning season.

If you use the conventional arrester mounting for distribution transformers, you have two types of Crystal Valve Arresters from which to choose—Sealed (Non-ventilated) and Ventilated Gap Arresters. Both have true valve action in conjunction with high-speed spark gap assembly to interrupt follow current, prevent hazards and fire risk.

CV Ventilated Gap Arresters are protected from corrosion by vents which permit the movement of air, prevent accumulation of moisture in housing. Amazing performance of this arrester under all service conditions proves better than 99% protection.

CV Sealed Type Arresters have the same high-speed multiple spark gap units, the same oxidized Silicon Carbide valve element as the Ventilated Gap Arresters.

Many distribution engineers prefer tank-mounting of Crystal Valve Arresters because of its simplicity, space conservation, efficiency and economy of installation.

Thousands of CV Arresters are giving permanent protection to "power packages" under all types of weather conditions. Many of the leading transformer manufacturers furnish their product with CV Arresters. They know Crystal Valves give unlimited surge capacity at all ratings and can be installed on all types of circuits without regard to system capacity. The four CV-equipped transformers shown here have positive protection against lightning damage, power surges, and harmful over voltage.

CRYSTAL VALVE
LIGHTNING ARRESTERS

2-WAY CHOICE WITH

JOB-ENGINEERED ARRESTERS

2 TRANSFORMER MOUNTING

FOR CV PORCELAIN SEALED OR VENTILATED ARRESTERS

■ 37½ KVA Allis-Chalmers Protected Type CP-1, Single-phase Transformer with 9 KV Crystal Valve Arrester. Primary voltage, 13,200 GrdY/7620; low voltage, 120/240 volts.

■ 37½ KVA Pennsylvania "Protected Pole Star" Transformer with 9 KV Crystal Valve Arrester. Furnished in sizes 3 KVA through 100 KVA, up to 14,400 volts.

■ 10 KVA Kuhlman CSP Single-phase Transformer with 9 KV Crystal Valve Arrester. Primary voltage, 7200/12,470Y; low voltage, 120/240 volts.

■ 5 KVA Moloney HiperCore Type CSP B-1 Single-phase, 60-cycle Transformer with 3 KV Crystal Valve Arrester.

Electric Service Manufacturing Co.

PHILADELPHIA 32, PENNSYLVANIA

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto

New **HOMELITE** Pump

Whispers While It Works

Goodby residential complaints! Here's a new lightweight gasoline engine driven pump that takes it easy on the neighbors' ears. Yet handles any water problem . . . from seepage to volumn pumping! The new Homelite Model 36 S2 2″ self priming centrifugal Pump operates at slow speed with low noise level yet has high capacity of 9000 gallons per hour. It weighs only 85 pounds and can be easily carried by one man to the best pumping location. Starts quickly, primes automatically, gives long, dependable and trouble-free service under the toughest conditions. Ask your Homelite Representative for a free demonstration. You'll find a good neighbor policy in every pump.

HOMELITE CORPORATION

A Textron American Company

6110 RIVERDALE AVENUE • PORT CHESTER, N. Y.

FACTORS TO BE CONSIDERED IN SELECTION OF HIGH TEMPERATURE STEAM POWER PIPING	
STEEL MANUFACTURE AND RAW MATERIALS PROCESSING FACTORS	MELTING AND CASTING HOT WORKING HEAT TREATMENT INSPECTIONS ACTUAL EXPERIENCE WITH SPECIFIC COMPOSITION
FABRICATION FACTORS	HOT BENDING, FORGING HEAT TREATMENT WELDING POST HEAT TREATMENT MACHINING INSPECTIONS ACTUAL EXPERIENCE WITH SPECIFIC COMPOSITION
SERVICE FACTORS	HIGH TEMPERATURE LOAD CARRYING CAPACITY (x1000) STABILITY WITH TIME GENERAL

AS POWER PIPING BECOMES MORE CRITICAL

M. W. KELLOGG'S METALLURGICAL LABORATORY KEEPS PACE

As shown above, there are many factors—all increasingly important to steam-electric power plants—in selecting materials for tomorrow's main and reheat steam piping needs. Prepared by M. W. Kellogg's metallurgical laboratory, and reproduced here only in part, this chart indicates the extent to which Kellogg's metallurgical laboratory supports Kellogg's fabricating facilities in meeting the challenge of higher temperatures and pressures.

One recent Kellogg assignment, by a leading public utility, is the problem of selecting a super alloy for main steam piping to operate at 5500 psi and 1200 deg. F. A testimonial to the leadership and experience of the M. W. Kellogg metallurgical laboratory, this problem will include selection of special welding materials, welding techniques, and heat testing procedures.

Working closely with power companies at every stage of such problems is the prime function of Kellogg's metallurgical laboratory, and is carried through to periodic inspection of the piping in service. We welcome the opportunity to acquaint you with these facilities.

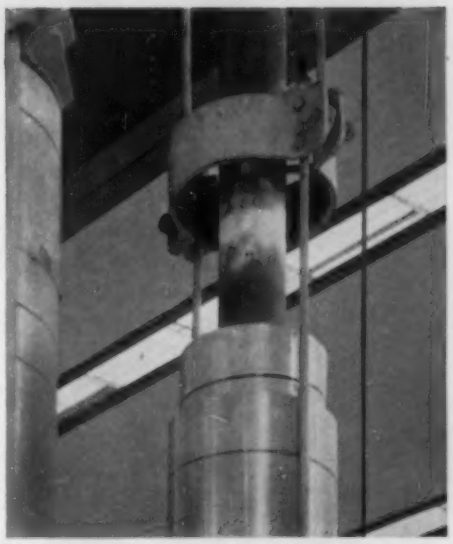
FABRICATED PRODUCTS DIVISION

THE M. W. KELLOGG COMPANY, 225 BROADWAY, NEW YORK 7, N. Y.

The Canadian Kellogg Company, Ltd., Toronto • Kellogg International Corporation, London

SUBSIDIARIES OF PULLMAN INCORPORATED

**Trademark of The M. W. Kellogg Company*



The soundness of Kellogg's metallurgical studies prior to fabrication is evident from the condition of the welds on this stainless steel power piping when inspected recently. In service for 18 months at 2350 psi and 1100 deg. F., over 70 butt welds made with Kellogg's K-Weld* process were found to be in perfect condition. *(Photo at power station, Kearny, N. J., courtesy Public Service Electric & Gas Co.)*

POWER PIPING—THE VITAL LINK

97 times more ozone-resistance in the new

U.S. Royal Master High-Voltage Power Cable

***Amazingly* better than ANY of the 5 leading brands tested!**

Test A—Here, a sample of 5 KV unshielded U.S. Royal Master Power Cable was bent into a U-shape, roughly 8 times its overall diameter. Placed upright on a grounded metal plate, a conductor-to-plate potential of 40,000 volts was applied. Because of this high test potential, the air broke down—and ozone cracks appeared. All 5 competitive cables failed within 20 minutes to 35 hours. The U. S. Cable was still going strong after 3400 hours! That's *real* ozone-resistance!

Test B—A sample of the new U.S. B-18 ozone-resistant neoprene jacket was stretched 200% of its original length, clamped in a metal rack, and put in an ozone chamber... where the ozone concentration was adjusted to .025% to .030% volume. Five other competitive jackets taken from leading brands were likewise placed in the chamber. Within 2 and a half hours, all jackets had failed—EXCEPT "U. S." This jacket sample did not fail until after 18 hours' exposure!

PROVED BY TESTS

For full facts about the great high-voltage cable, call your nearest United States Rubber Company District Sales Office or write to address below. A representative will arrange to conclusively prove these facts.

US RUBBER

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE & CABLE DEPT. • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

NOW!

YOUR CHOICE OF 2 SIZES in...

BLACKBURN *Aluminum* SERVICE WEDGE CLAMPS

W2-OA—For 2 solid or 4 ACSR to 1/0 ACSR. Standard Stainless Steel Bail
W6-4A—For 6 solid or 6 ACSR to 4 ACSR. Standard Stainless Steel Bail
Type FC—Flexible bail of phosphor bronze, both ends captured in clamp.
Type VP—Standard bail with abrasion resistant Vinyl Plastic covering at point of contact.
Type FF*—Flexible bail of phosphor bronze, one end captured—one end free.
*This type available in W6-4A only.
BLACKBURN W2-OA
BLACKBURN W6-4A

ALL BLACKBURN WEDGE CLAMPS HAVE FULL GRIPPING SURFACE

—Conductor is in contact with the wedge for the entire length of the slider and, *they are easily installed.*

- **Removable aluminum slider allows clamp to be installed without threading through clamp.**
- **Drop wire can be pre-sagged and cut to exact length—saves conductor—saves time.**
- **Clamp can be attached to bare neutral at any point in the span.**

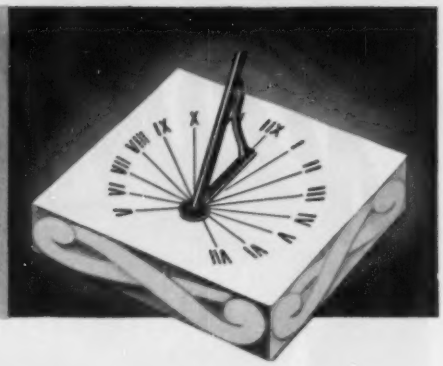
Available through electrical wholesalers everywhere.

JASPER BLACKBURN CORPORATION

35 MADISON STREET
ST. LOUIS 6, MISSOURI
PHONE MAIN 1-2821

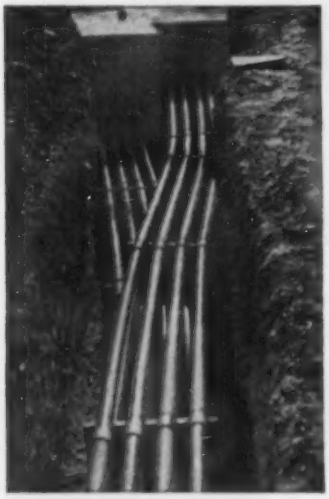
QUALITY

...proved by TIME...



Of course the most convincing proof of Orangeburg's enduring quality is its 62-year record of service to leading Public Utilities, Municipalities and Contractors.

Quality stands out in every feature. Orangeburg Fibre Conduit is lightweight yet strong, tough and resilient. Its impermeable walls and tight joints keep out corrosive ground waters. Its smooth bore and low coefficient of friction protect cable sheaths from abrasion. Orangeburg material resists acids, alkalies, salt, grease and oil.



ORANGEBURG STANDARD is installed with concrete encasement. Preferred for banks of three or more ducts.

For these and other advantages Orangeburg provides complete security for electrical services underground. Result...no interruption of power. These vital services keep flowing.

SAVES MONEY, TOO!

Saves by prolonging cable life . . . by faster and easier handling, tooling and laying . . . and by the use of Orangeburg's standard fittings. They cut costs by simplifying installation. Send to Dpt. EW-105 for more facts.

ORANGEBURG MANUFACTURING CO., INC.
Orangeburg, New York
West Coast Plant — Newark, California

ORANGEBURG NOCRETE is installed without concrete encasement. Extra heavy wall for direct burial.

ORANGEBURG®
FIBRE CONDUIT

STANDARD INSTALLED WITH CONCRETE

NOCRETE INSTALLED WITHOUT CONCRETE

Graybar ELECTRIC COMPANY

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT
BRANCHES AND STOCKS IN PRINCIPAL CITIES

GENERAL ELECTRIC SUPPLY COMPANY
A DIVISION OF GENERAL ELECTRIC DISTRIBUTING CORPORATION

Designed and built to specifications you might have written...

Power Capacitor Specifications

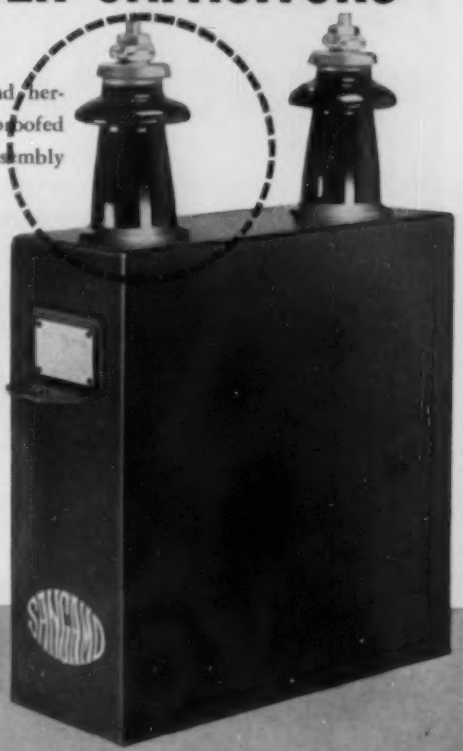
1. Corrosion protection – even though case finish is scratched.
2. Solder-sealed porcelain bushings.*
3. Reliable performance at low ambient temperature.
4. Suitable for vertical or horizontal mounting.
5. Low losses.
6. Low temperature rise.
7. Stability under all operating conditions.
8. Terminal connectors for either copper or aluminum.

SANGAMO POWER CAPACITORS

* This solder-to-porcelain bonding technique permanently and hermetically seals the all-weather porcelain bushing to corrosion-proofed metal fittings. Induction soldering then seals the bushing assembly directly to the case. The bond is so strong that the capacitor can be readily handled by its terminals without the slightest danger of disturbing the seals.

Some of the utility men we talked to particularly liked the idea of the Sangamo Capacitor's heavily tin-plated terminal parts. This tin-plating practically does away with corrosion problems with either copper or aluminum conductor. The parallel groove clamp makes connections easier... two conductors from #8 solid to #4 can be inserted without removing the terminal nut.

For more details on this power engineer's capacitor, write today for Bulletin 1120.



SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

PC53-4

Control cables are in at Niagara-Mohawk's

..."ROLENE" CABLE INSULATION MADE OF BAKELITE POLYETHYLENE MEETS RIGID LONG-LIFE REQUIREMENTS

In a remote-control operation like Niagara-Mohawk Power Corporation's Dunkirk, N.Y., station, control cable breakdown is a serious matter. That's why polyethylene insulation was specified for the many thousands of feet of multi-conductor cable in this installation. *It assures maximum service life under all operating conditions.*

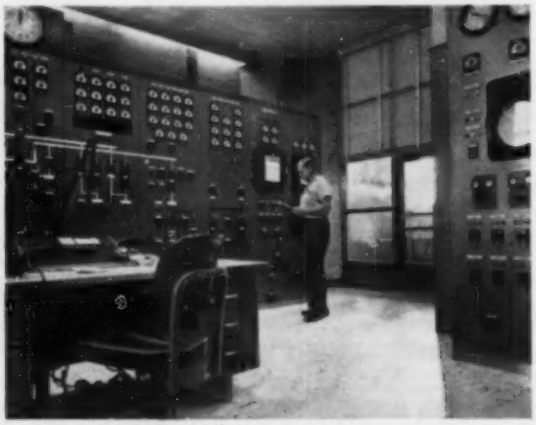
Dunkirk steam station. Total rated capacity is 200 MW

Based on BAKELITE Polyethylene, the insulation for this cable provides outstanding electrical and mechanical characteristics. It's tough and flexible, resists most chemicals, weathering, oxidation and oils. It is virtually unaffected by water and low temperatures. Dielectric loss is low at all frequencies (dielectric constant is 2.3; power factor is .0004).

The Dunkirk installation—entering its 6th year of operation with a record of perfect cable performance—is an outstanding example of how much BAKELITE Polyethylene contributes to help make better cable. For more detailed information on BAKELITE Polyethylene for sheathing, jacketing or insulation, write today to Dept. LH-53.

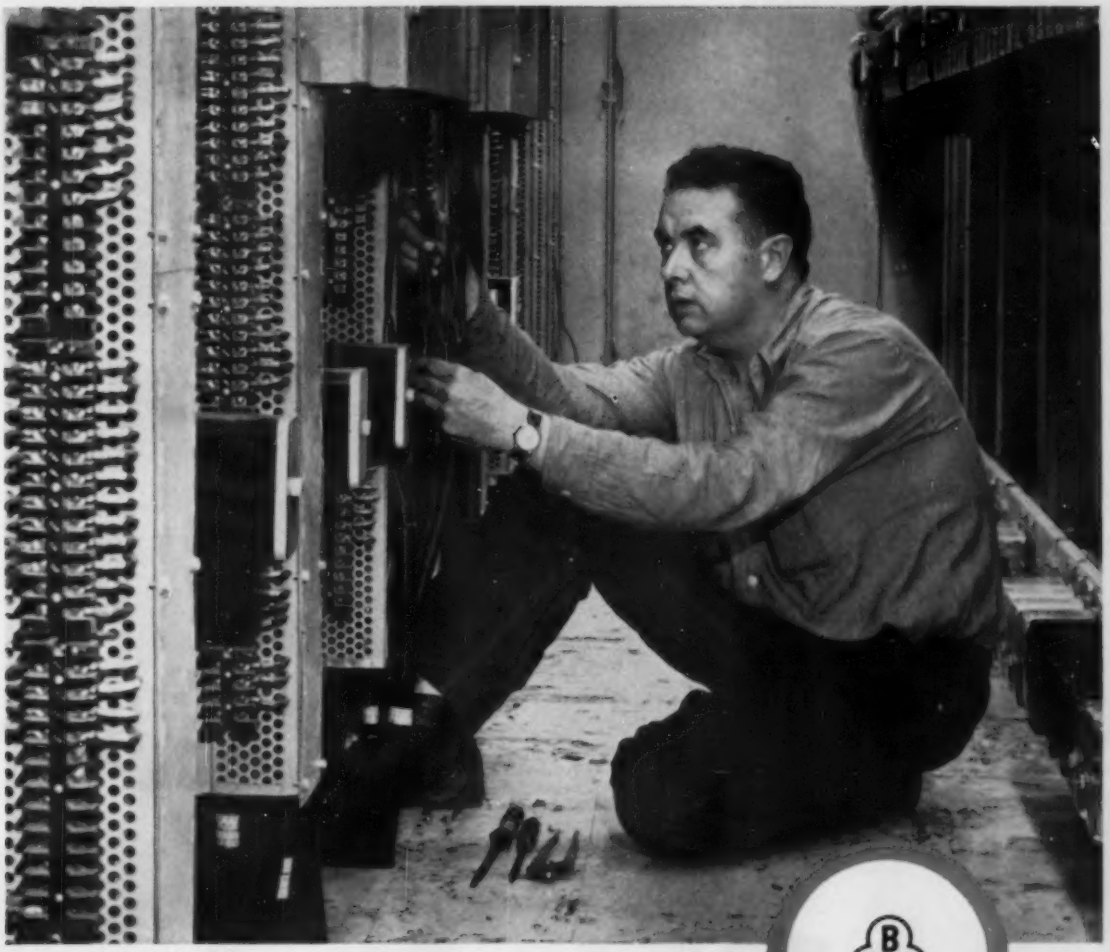
"Rolene" insulated control cable manufactured by **The Rome Cable Corporation,** Rome, N. Y.

ADJUSTING a cable's position in the control housing of a 115 KV oil circuit breaker outside the station.



TAKING A READING from a meter on the electrical control panel in the main control room. One man has complete operational control over all switches in the station.

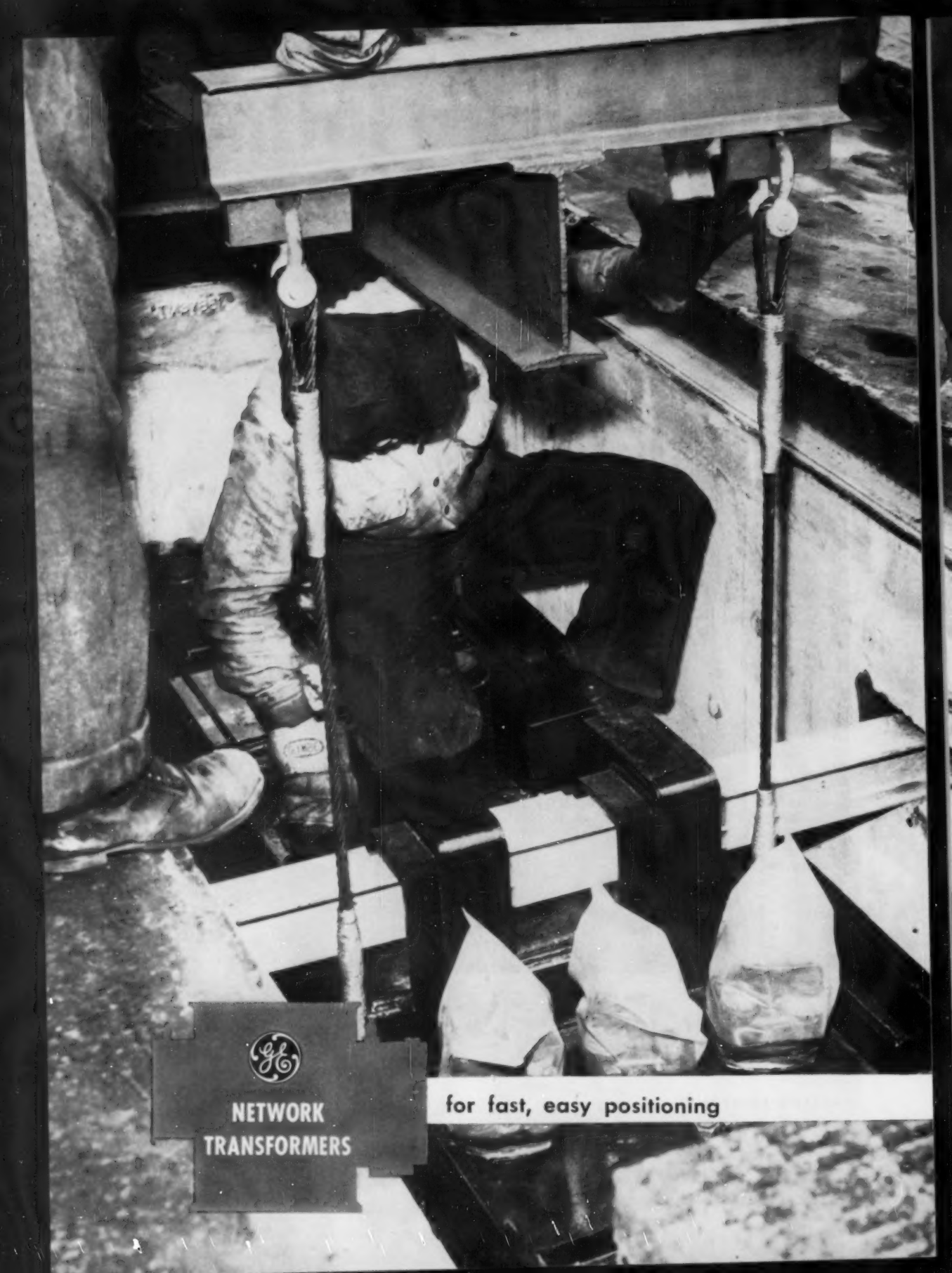
to stay
Dunkirk power station



INSTALLING two 7-conductor "Rolene" insulated cables at the rear of the main control board. Despite varying ambient temperatures throughout the station—in some places as high as 130 deg. F.—BAKELITE Polyethylene stays flexible, will not dry out and crack.

BAKELITE
BRAND
Polyethylene Plastic

BAKELITE COMPANY,
A Division of Union Carbide and Carbon Corporation UCC
30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC


NETWORK
TRANSFORMERS
for fast, easy positioning

NEW SUSPENSION MOUNTING

reduces positioning time for G-E network transformers to minutes instead of hours

A new design idea—suspension mounting—now greatly simplifies installation and maintenance of network transformers.

Developed jointly by General Electric and Consolidated Edison Company of New York, suspension mounting enables you to position a transformer in a fraction of the time formerly required. Vault floors need not be level. Furthermore, your construction men can quickly level the transformer since it is much easier to shim an I-beam cross bar before hanging a transformer from it than to shim a transformer after placing it on a vault floor. The Consolidated Edison men placed their first unit in position and levelled it in less than 10 minutes!

MAINTENANCE IS SIMPLIFIED, TOO

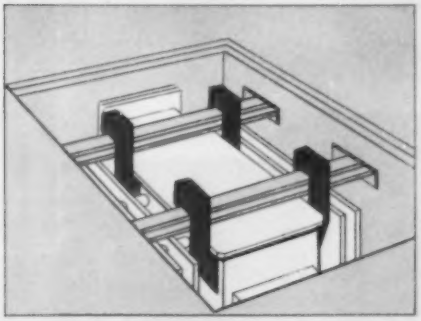
With suspension mounting, the transformer is 8 to 10 inches above the floor of the vault, away from corrosive elements such as sewage, dirt, and chemicals, which collect in most vaults. This retards corrosion of the tank, making it necessary to clean the vault far less frequently than when the transformer is set on the floor. When cleaning becomes necessary, it's easy to flush out the vault because there is clear passage under the transformer.

It's also easy to clean and repaint the transformer. Radiators are of the panel type, with large flat surfaces easily accessible from the top or ends. Just use a long-handled brush or nozzle.

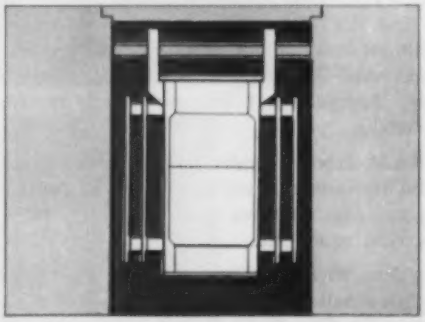
Maintenance is simplified in other ways, too. You can remove bushings, for example, from the outside of the tank. There are no large gaskets to replace. Accessories are located on the high-voltage end of the transformer where you can easily reach them. It's easy to inspect the network protector because it slides out on rails.

HELP FOR YOU

For help in solving your network problems and for complete information on the advantages of suspension-mounted G-E network transformers, see your local G-E sales representative. General Electric, Schenectady 5, N. Y. 415-6



SUSPENSION MOUNTING. Two sturdy hooks rest on I-beams installed above transformer. Each beam rests on bearing plate in side-wall recess.



PLENTY OF SPACE under transformer keeps it above chemicals and debris, retarding corrosion and permitting fast and easy cleaning of vault.

Progress Is Our Most Important Product

GENERAL ELECTRIC

K&M
Ebonized Asbestos

- **resists vibration**
- **resists shock**
- **resists temperature changes**

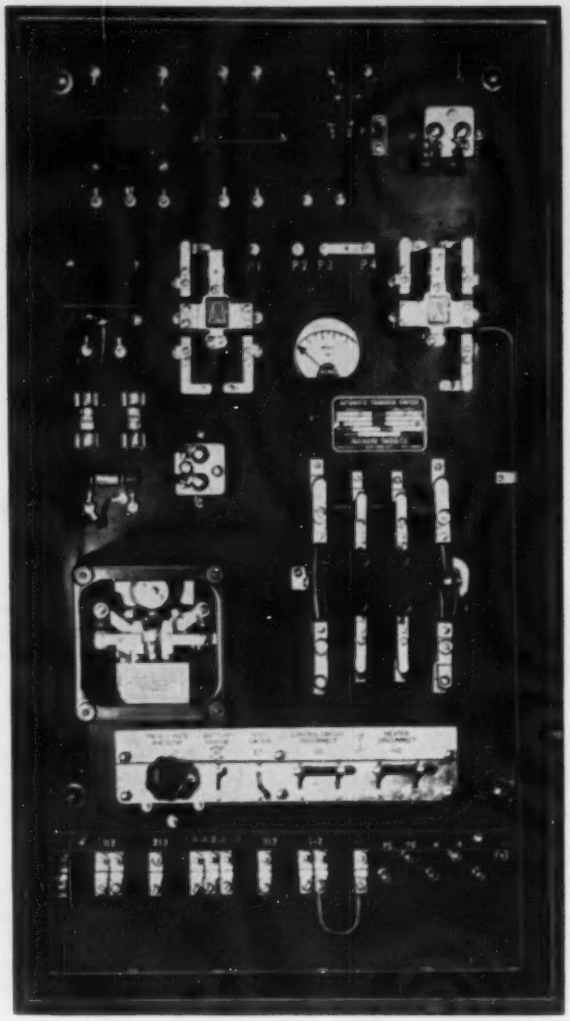
Specify this ideal insulating material for your mounting panels

Made of asbestos fiber and portland cement, molded under pressure into sheet form and impregnated with an asphaltic compound, K&M Ebonized Asbestos is the perfect insulating material. It has exceptionally high dielectric strength. Its high mechanical strength makes components stay put, provides stubborn resistance to vibration, shock, temperature changes. Ebonized Asbestos is light in weight, uniform in density, easy to cut and drill.

You'll find it's ideal wherever you need strong, shatter-proof insulating material for mounting electrical apparatus—on switchboards, bus bar supports, cabinets, compartment linings, bench boards, testing tables.

Other K&M Asbestos products include Monobestos (asbestos fiber and portland cement, highly resistant to arc, and fire), asbestos cloth, tapes and tubing for electrical equipment.

Send for data. We'll gladly send complete information on Ebonized Asbestos and other outstanding K&M insulating materials. Write for details.



This Automatic Transfer Switch, manufactured by Automatic Switch Co., Orange, N. J. is mounted on K&M Ebonized Asbestos.

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

K&M best in asbestos

In Canada: Atlas Asbestos Company, Limited; Montreal, Toronto, Winnipeg and Vancouver

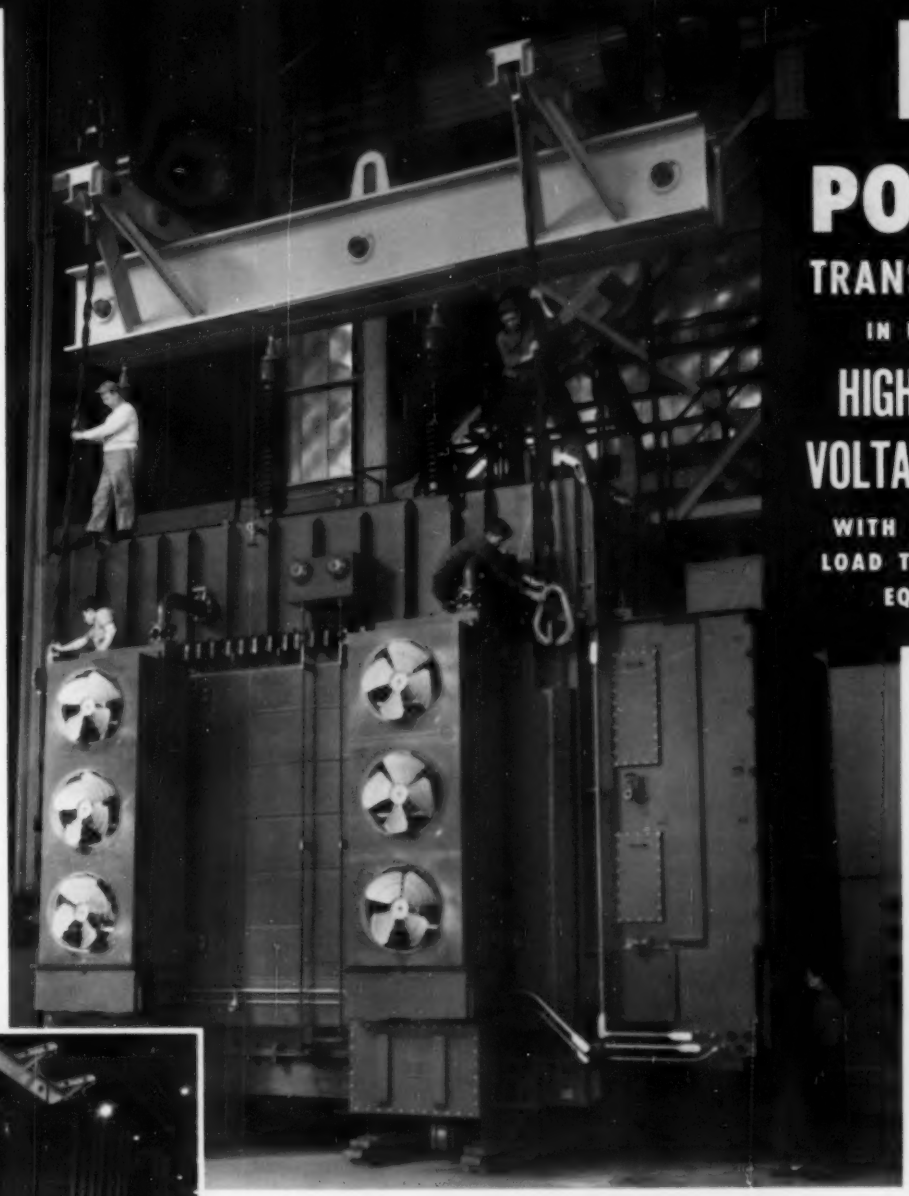
Bulletin No. PT2805-455

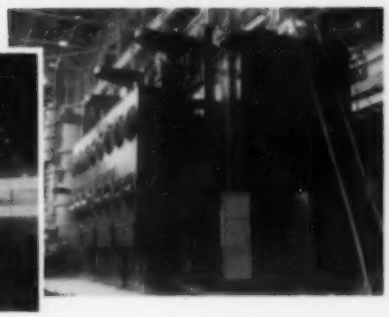
POWER TRANSFORMERS

IN UNLIMITED

HIGH KVA and VOLTAGE RATING

WITH OR WITHOUT LOAD TAP CHANGING EQUIPMENT

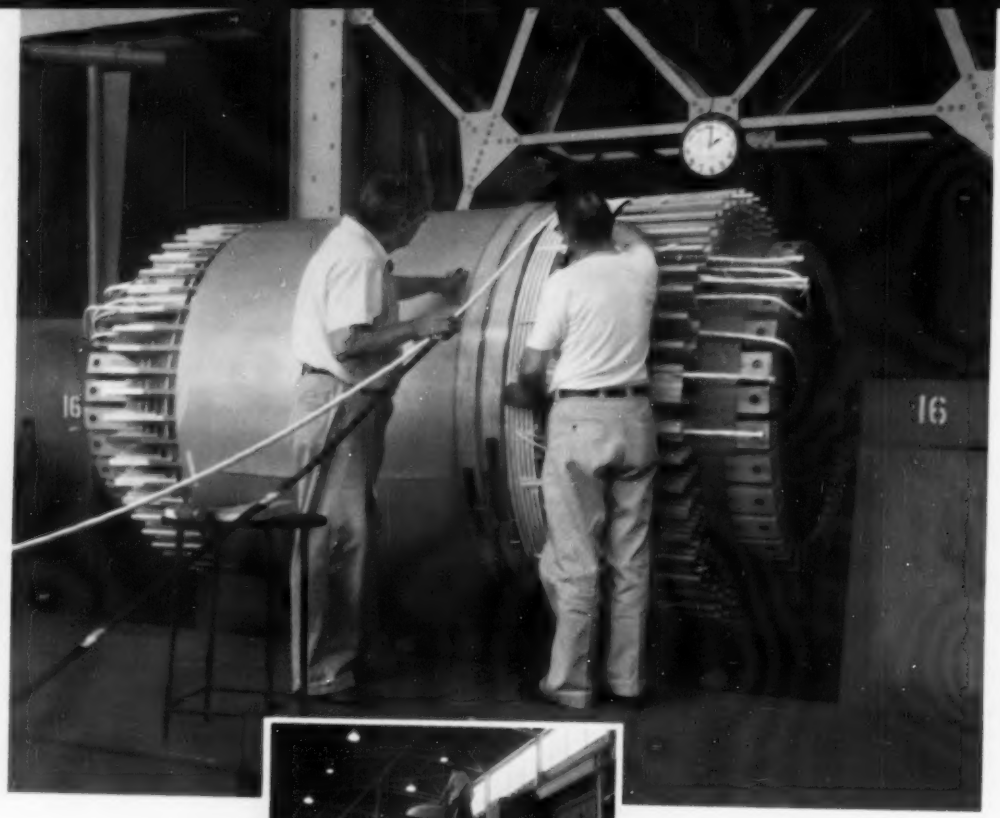




MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Capacitors • Magnetic Components for Electronics

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA



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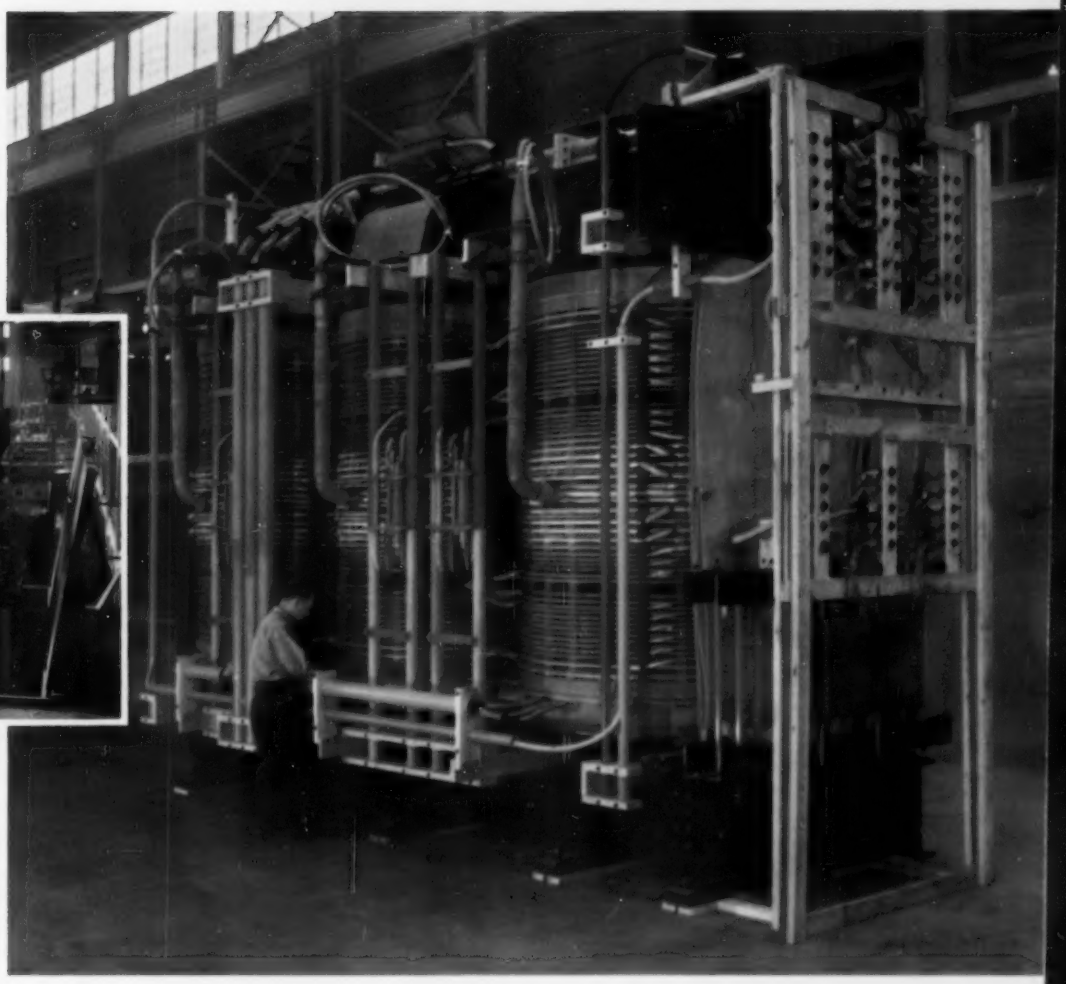
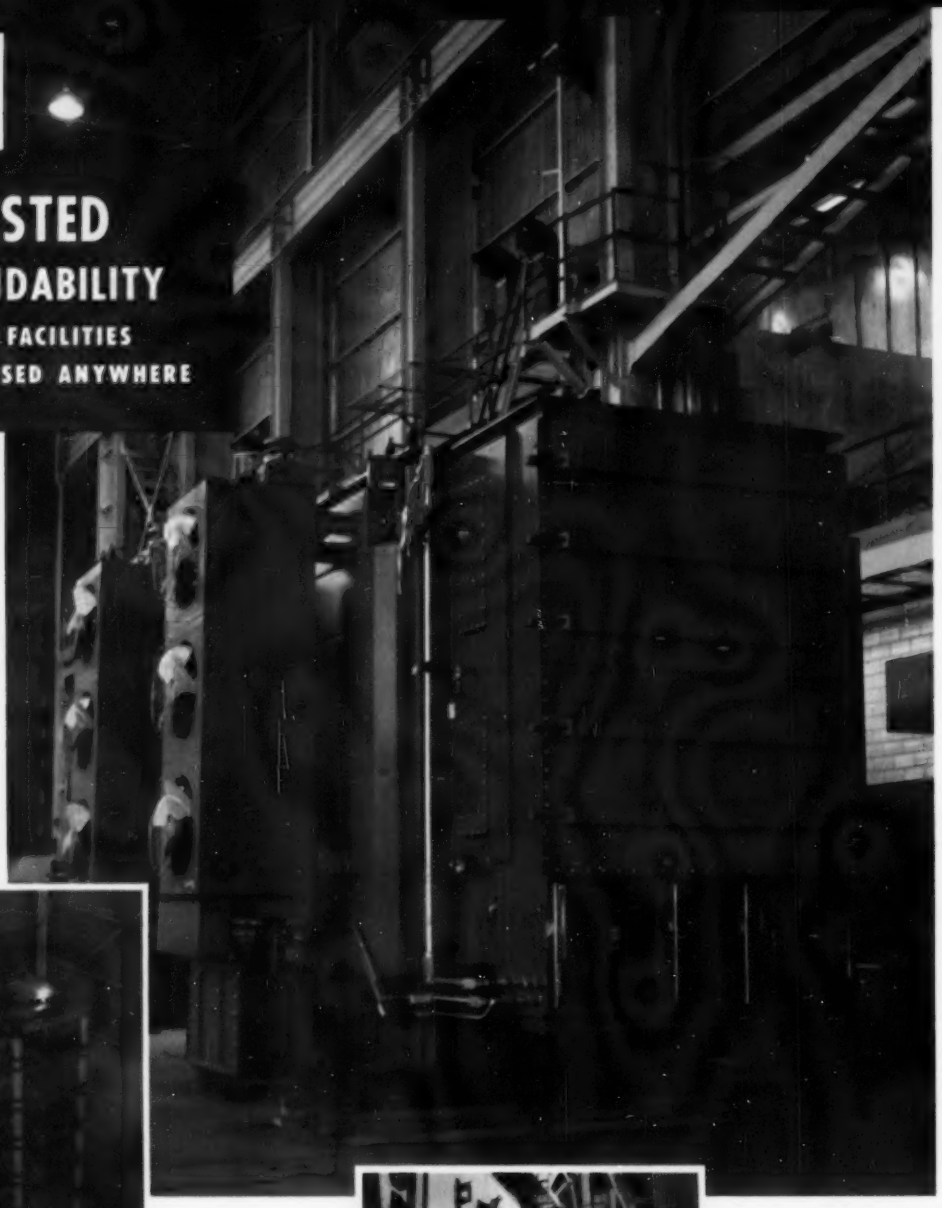
FLEXIBILITY IN DESIGN AND FABRICATION

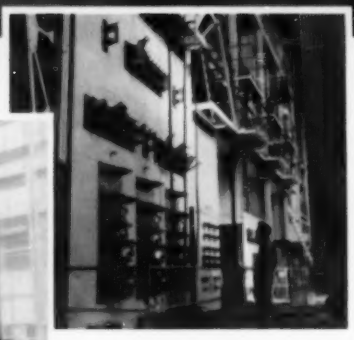
To best serve your system's needs and to offer dependability in operation and long, trouble-free operating life for an indefinitely long period.



FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

TESTED
DEPENDABILITY
WITH FACILITIES UNSURPASSED ANYWHERE





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FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

EDITORIALS

Electrical Companies Talk Back

The recent series of hearings by the Chudoff subcommittee (EW, Sept. 26, p 8) served a purpose for which they were never intended. They helped electric companies find their voices.

In Atlanta when the committee refused to hear electric company spokesmen, Harllee Branch, Jr, President of both Georgia Power Co and Edison Electric Institute, handed out a prepared statement to newsmen.

In San Francisco an attack on Pacific Gas & Electric Co brought an immediate and pointed reply from Executive Vice Pres Robert H. Gerdes.

In other areas electric companies were prepared to answer back at charges and testimony which reflected unfavorably on their operations but were given no hearing before the committee forum.

Where electric companies spoke up, there is some evidence that they turned the tables on the committee's Democratic majority. In Atlanta, for instance, public power and some rural electric cooperative representatives were reported distressed at the one-sided committee sessions. Some thought the committee had accomplished very little in its quest to find weak spots in Republican power policy. Both the "San Francisco Chronicle" and "San Francisco News" characterized the hearings in that city as "sorry performances."

It was obvious from the start that Chairman Earl Chudoff (D-Pa.) was taking the committee on a search for Democratic campaign issues. Witness lists were stacked to permit testimony almost exclusively from critics of electric companies and the Eisenhower Administration.

In the past electric companies have often chose to ignore such hearings. The former Senate anti-monopoly subcommittee, headed by Republican Senator William Langer, made inroads into Administration power policy with few protests from outside.

It is heartening that industry men are beginning to find their voices and are looking for ways to seize the initiative. As spokesman for the industry, Branch is helping to point the way to answer promptly and effectively the charges leveled at electric companies.

New Boost for Adequate Wiring

Electric utilities, through Edison Electric Institute, are taking a new forward step in promoting adequate wiring. In the past they have cooperated with other industry groups, but have done little to coordinate their own activities.

The diverse approaches they have adopted were clearly shown in a recent wiring survey (EW, June 27, p 107).

This month there will be a pooling of some of these experiences. On Oct. 17 and 18 utility men from the Mid-West will meet in St. Louis for a "Wiring Workshop" sponsored by Edison Electric Institute. It is to be the trial run of what EEI hopes will develop into a series of regional workshops throughout the country.

Its purpose will be: (1) To exchange information on wiring promotion activities between companies; (2) To resolve what needs to be done, and specifically what EEI can do to help without duplicating efforts of other industry groups.

Says EEI's Commercial Chief Jim Coatsworth: "We hope to determine what we should be doing that we're not. From there, we can start to develop the program and tools to do the job."

Coatsworth emphasized that the workshop will be just what it says: Work.

"We have an informal program lined up. Speakers from some of the most active utilities in the area will lead off with explanations of the merits and pitfalls of their programs. With that we'll go into discussion. This workshop idea has worked in our other branches of electrical promotion. We hope it can work here."

Electrical World hopes so, too. The St. Louis session will be EEI's first formal safari into the inadequate wiring jungle since formation of its wiring committee at last spring's sales conference. It could cut the preliminary patterns for a whole new unified utility wiring program—one that could compliment, not duplicate, the fine efforts already put in force by our friends in other segments of the industry.

Crusade for Street Lighting

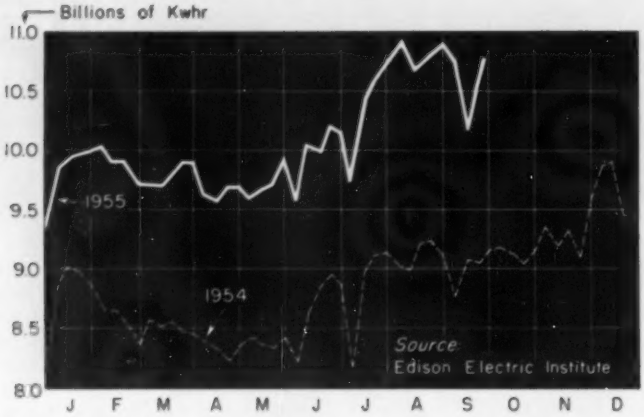
The ordinary citizen in his flight to the suburbs is more conscious of the need for adequate street lighting. He does more of his shopping and visiting in the dark hours. Much of his leisure time is night time. He is constantly demanding the street lighting he needs.

Mayors, councilmen, and other political leaders are well aware of the pressures building for better lighting. In some areas they have taken the initiative in planning for and providing adequate lighting to satisfy public demands.

For the utility there is one safe course of action. That is, seize the initiative. Lead the crusade for better street lighting. Utilities are uniquely equipped to promote, provide, and maintain street lighting. In most localities they alone have the technical competence, the equipment, the trained manpower to do the job. Furthermore, they have an important stake in the future of the communities they serve.

In this issue (p 101) Electrical World presents the affirmative case for hard-hitting street lighting promotion. It is our contribution to your crusade for better street lighting.

ELECTRICAL WEEK



OUTPUT

Week Ended Sept. 24
10,756,000,000 Kwhr
Up 18.6%

Atomic Energy Commission requirements – 1,001,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 13.4%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Sept. 24	+18.6	+12.1	+10.6	+30.2	+12.1	+22.3	+14.3	+22.8	+10.6	+10.6
Sept. 17	+17.1	+10.6	+8.4	+27.8	+9.7	+20.8	+10.4	+21.6	+12.2	+14.8
Sept. 10	+15.3	+8.6	+6.3	+26.0	+5.0	+21.0	+1.6	+20.1	+12.8	+17.4

Seasonally Adjusted Index 205.9 Week Ago 201.8 Year Ago 173.5

The Issue's Highlights—Proposed merger of Washington Water Power and Puget Sound P&L produces little meat for Sen O'Mahoney's utility merger investigation . . . Impact of Ike's heart attack on political outlook appraised . . . AEC offers complete financing for small REA projects . . . Elk River Co-op's proposed nuclear power plant plan turned down by AEC for "technical" reasons . . . State investigation of Santee-Cooper points to co-op contracts as principal cause of financial difficulties . . . Reclamation Bureau speeds Trinity River project . . . Los Angeles Department of Water & Power is using paralleled secondaries and banked transformers to serve 104-home unit cooling load . . . Southwestern PS cuts costs with new H-frame design for 230-kv line.

Atomic Industrial Forum—Secrecy restrictions on peacetime atomic information must be substantially eased if this country is to be a leader in the coming worldwide atomic products market, said Francis K. McCune, General Electric vice president and general manager of company's atomic products division.

Atomic Markets—It is "a matter of good business" for the U. S. to speed development of atomic electric power plants, according to Sen John W. Butler (R-Md.). A number of countries lacking abundant cheap electricity will be early markets for smaller atomic power plants, he maintains.

Atom and Coal—National Coal Association has formed committee to engage in continuing study of impact of atomic energy on operations of coal industry. Committee will examine possible influence of AEC's present power reactor program on bituminous industry, and formulate policy with regard to atomic energy.

Labor—Sacramento Municipal Utility District has increased wages of all weekly rated positions by 7½¢ an hour. About 330 weekly rated employees are involved, principally doing overhead and underground construction work . . . Hawaiian Electric and IBEW-AFL agree on 5 to 7¢ an hour wage increase.

Copper—Fourth quarter refined copper supply will meet domestic and export requirements but will not be sufficient to replace inventories—now "dangerously low"—according to BDSA's Copper Division. William A. Meissner, division's deputy director, told NEMA's Wire and Cable Section meeting last week copper situation "can be summed up in one word—price. There is sufficient copper available to meet requirements," he said, "but there is not sufficient low price copper to meet them."

NEWS OF THE INDUSTRY BRIEFLY TOLD

Off the Washington Wire—FPC has denied rehearing on its rejection of applications for three interlocking directorships. Requests had been by William J. Froelich and John P. Wagner to be directors in both Wisconsin PS and Byllesby & Co, and Edward O. Boshell, now director of Duquesne Light and Westinghouse, to be a Byllesby director . . . FPC has authorized merger of St. Joseph L&P and Missouri Service Co, with St. Joseph surviving . . . Effects of atomic energy on electrical industry will be featured at first national electrical exposition during 54th anniversary convention of National Electrical Contractors Association in New York Oct. 26-Nov. 3.

Company changes—International Harvester Pres John L. McCaffrey announces that company has sold plant and property of its refrigerator division at Evansville, Ind., to Whirlpool-Seeger . . . Lower St. Lawrence Power Co, Rimouski, Que., Canada, will purchase facilities of Matapedia County Electricity Co-operative.

Regulatory—New Mexico voters rejected at special election Sept. 20 a proposed state constitutional amendment for revision of state's public utility regulatory machinery. Among other things, amendment would have placed burden of proof in rate increase cases on utility rather than PSC as at present . . . Iowa-Illinois G&E has obtained temporary court injunction permitting the utility to increase Davenport rates ¼¢ a kwhr.

Construction—Pacific P&L has asked ODM for accelerated tax amortization certificate for $23-million, 100,000-kw steam plant at either Casper or Lake Desmet, Wyo.

Financing—Alabama Power is planning to sell up to $15 million of first mortgage bonds . . . Philadelphia Electric will offer 100,000 shares of common stock to employees . . . Oklahoma G&E has sold privately 50,000 shares of $100 par 4.20% cumulative preferred stock through Merrill Lynch, Pierce, Fenner & Beane.

Roundup—Harvey Aluminum will start construction of much-delayed $65-million primary aluminum plant at The Dalles, Ore., in early 1956 . . . Use of sun's energy for heat and conversion to electrical power can be expected within next 20 years, according to Dr G. D. Brown, dean of college of engineering at University of Michigan . . . Delaware P&L expects to earn $2.25 a share this year compared with $2.08 in 1954, Pres Stuart Cooper told New York Security Analysts.

ABOUT PEOPLE IN THE INDUSTRY

Clarence A. Davis, Under Secretary of Interior, last week spoke out against public power advocates. Citing Northwest power situation, he said he was "sick and tired" of the "political hogash" of the socialists who want to federalize the nation's electric power industry. "The time has come," said Davis, "to start getting down to facts, to strip away some of the bunk and misrepresentation and to pull the sheep's clothing off from some of the socialists who are utilizing this issue to achieve political objectives."

As utility representatives prepared this week for Public Information Program workshop conference in St. Louis, R. D. Furber of Northern States Power Co, workshop conference chairman, called attention to the urgency of the conference theme: "Let's Face The Facts". Recent developments point up the importance to the industry of the 'wraps off' discussion for which the workshop is known," said Furber. Washington trends, the present public versus private power picture, and Hells Canyon are among topics.

More News About People page 188

ANTITRUST SUBCOMMITTEE CHAIRMAN O'MAHONEY (HEAD OF TABLE) and FRANK McLAUGHLIN (FAR RIGHT)

Senate Unit Investigates Merger Plan

- **Proposed Washington WP-Puget Sound P&L link probed in hearings**
- **Influence of Ebasco questioned; legality of arrangements established**

A Senate subcommittee headed by Sen Joseph C. O'Mahoney (D-Wyo.) recently focused three days of hearings on the proposed merger of Washington Water Power Co and Puget Sound Power & Light Co.

He called in top-level witnesses from a dozen Wall Street securities houses, as well as principals in the merger and representatives of Ebasco Services, Inc; Electric Bond & Share Co; Pacific Northwest Power Co; and the Federal Power Commission.

Five years ago, Puget Sound P&L arrived at an agreement with a group of Public Utility Districts with which it had been warring. The settlement called for purchase by the PUD's of the entire Puget system for about $100 million.

The PUD's obtained legislative sanction, and the sale seemed to be going smoothly. But these events occurred:

- The PUD's couldn't raise the money.
- Puget sued Washington Water Power on grounds of interference and implicated Ebasco, as Washington Power's consultant.
- Puget stockholders, in turn, sued to enjoin Puget's sale to the PUD's.
- Washington Water Power offered to merge. Puget agreed.
- Intervenors tied the merger up in the state commission and the courts.

As a result of being hemmed in on all sides from disposing of its properties, Puget management made up its mind to continue as an independent private utility. Technically, that's where the matter now stands.

O'Mahoney, however, argued otherwise. His questioning was designed to show that Washington Water Power has never stopped pressing for the merger and that Ebasco's consultant for the utility was utilized as a Wall Street agent to promote the deal.

O'Mahoney devoted the first two days of his hearings to questioning representatives of New York securities houses. He tried to put across the point that they were employed to solicit proxies from Puget's stockholders. But he failed to show (1) that Ebasco and Electric Bond & Share Co were behind these solicitations, and (2) that Washington Water Power was interfering with the internal workings of Puget, another operating utility.

He tried first to get the name of

FRANK McLAUGHLIN

KINSEY ROBINSON

FRED C. GARDNER

Ebasco into the tale. He frequently interposed Ebasco's name between Electric Bond & Share and the Pacific Northwest merger, trying hard to pin the label of "conspirator" on the engineering firm.

Here's what he wound up with:

• Denials that Ebasco's role in the merger was improper. Ebasco Pres Frederick C. Gardner, Electric Bond & Share Pres George G. Walker, Washington Water Power Pres Kinsey M. Robinson, Ebasco Consultant William E. Parrott — all testified that Parrott's job as consultant to Robinson was carried out honorably and that his advice on the merger was solicited by Robinson, rather than dictated by Wall Street.

• O'Mahoney's own admission that nothing illegal had occurred. At one point in his discussion with Electric Bond & Share's Walker, O'Mahoney stated, "I'm not implying anything illegal. I make no charge, no insinuation of illegal activity. Your operations are within the law."

Shaving of Law Alleged

But he added, "There's been some 'shaving' of the law. You have come within three-hundredths of 1% of violation. We're trying to find out if there should be a change in the law . . ."

O'Mahoney would change the law; he's not trying to find out if it needs changing. He's trying to create a cloud of suspicion about Electric Bond & Share and Ebasco which will convince other members of Congress that the electric utility empires, ordered broken up by the Public Utility Holding Company Act of 1935, are still operating.

O'Mahoney claims that Wall Street control of the nation's operating utilities is maintained through "friendly relations and contacts," "gentlemen's agreements," rather than stock ownership.

O'Mahoney's Projected Action

Even if true, these violations of the spirit of the law are hard to legislate. But if O'Mahoney can convince his colleagues to go along with him, here is what he would do to put a stop to this practice:

He would require, by law, that unorganized owners of small blocs of stocks be represented on utilities' boards of directors. This provision would apply to all corporations with more than so many stockholders.

(Continued on page 83)

Ike's Illness Revises Outlook

. . . for Presidential election; brightened Democratic hopes ride with public power advocates Stevenson, Harriman, and Kefauver

The coronary thrombosis that sent President Eisenhower to a hospital bed in Denver also toppled a whole set of basic political assumptions in Washington.

Where before it was assumed that Eisenhower would run and win, now the political observers in Washington feel certain he won't run and Republicans will have a tough time winning without him.

Focus on Democrats

The new presumptions, shifting favorite odds to the Democratic side, focus new attention on Democratic presidential possibilities. Three big names stand out—Adlai Stevenson of Illinois, Gov Averell Harriman of New York, and Sen Estes Kefauver of Tennessee.

All three of them are of the liberal New Deal-Fair Deal school and can be expected, in months ahead, to attack the Administration's power and resources development policy. All three see it as a "give-away."

During the remainder of the presidential term, the Eisenhower policy will continue as is — no matter what course the President's illness takes.

Outlook for the Long Run

For the long-run, the outlook is different. Democrats have seized upon public-vs-private power as one of their livest issues for 1956. There is no reason to doubt that they would, if given the chance in 1957, abrogate Eisenhower's local-private partnership approach and revert to the New Deal-Fair Deal theory that federal public power has a big place in national policy.

This is one area where party differences can be drawn in black and white. The GOP is committed, through Eisenhower and its Congressional leadership, to the theory that local or private interests should develop power resources on their own wherever possible.

The Republicans being considered as successors to Eisenhower are generally supporters of Eisenhower's views.

A list of Republican names being mentioned as potential presidential timber in 1956 leads off with Vice Pres Richard M. Nixon. Others included are Chief Justice Earl Warren, Gov Goodwin Knight of California, ex-Gov Thomas E. Dewey of New York, and Sens William F. Knowland of California and Everett M. Dirksen of Illinois.

On the other hand, there is little question about how the Democratic "big three" stand on this important issue.

Kefauver ranks as the patron saint of public power, largely because of his longtime advocacy of TVA. He added to this reputation most recently by his fiery investigation of the Dixon-Yates contract.

Adlai Stevenson Appraised

Stevenson is popular with public power advocates, too. He denounced the Eisenhower partnership program as a give-away in an Albuquerque speech last fall, and he outlined his own philosophy in a 1952 campaign speech at Seattle:

"Works like Grand Coulee and Bonneville were beyond the capacity of private enterprise to undertake. If the government had not built them, they would not have been built at all. Hard American common sense concludes that where private enterprise is unable or unwilling to develop our resources, the government should . . . But it is public funds we invest. The returns on the investment must be real, not hypothetical, and the gains must be national, and not merely local."

Harriman's Chances Uncertain

Harriman, a veteran of the New Deal, is viewed as a good friend of public power, but its advocates like him as a Presidential prospect much less than Kefauver or Stevenson. Right now, they're annoyed at Robert Moses, Harriman's chairman of the New York State Power Authority, over allocation of power from the St. Lawrence River Project (EW, July 11, p 84).

The New York governor could enhance his standing with public power people by interceding to settle the dispute to their satisfaction.

AEC Offers Aid to REA's

. . . and public power groups; will consider complete financing of promising designs submitted in 5,000 to 40,000-kw range

Atomic Energy Commission has instigated a program to help Rural Electrification Administration cooperatives and public power groups participate in the development of atomic power.

Announced a few days before the nation's first atomic industry trade fair was set to open in Washington, D. C., the new plan involves smaller reactors. The types to be considered, AEC Chairman Lewis L. Strauss said, would benefit power users in "certain areas" and also "help meet requirements of foreign countries."

• AEC will consider complete financing of promising power reactor designs in the 5,000-40,000-kw range. AEC said it would, for the first time, consider complete financial underwriting of costs of small reactor systems. It would retain title to that portion of a nuclear power plant financed with federal money.

• Fuel economy will be a criterion for acceptance of proposals. While use of refined uranium has always been a consideration in the industrial power program, AEC has not before indicated strongly that it would look with disfavor on reactor designs which demand large quantities of U-235. Under the new program the agency makes clear it will favor plans which call for less than 10% enrichment with U-235.

• Government fees for use of source materials and nuclear fuel, and payments for technical information uncovered during research and development work on private reactors will be waived for five years. Under the original reactor demonstration program—in which Detroit Edison Co and Nuclear Power Group, Inc, headed by Commonwealth Edison Co, qualified with fast-breeder and boiling water plants—AEC agreed to waive fuel fees for a period of seven years beginning July 1, 1955; it now does this for five years beginning with date of license.

• AEC will not manufacture fuel elements. It will estimate charges for chemical processing of elements and waste storage and other services, but it will not make the elements. Apparently, the agency is counting on several planned private fuel fabrication facilities coming into operation before any reactor proposals received under the new program are ready to roll.

• Three sizes will be considered: 5,000-10,000 kw; 10,000-20,000 kw, and 20,000-40,000 kw.

PNP Asks License for Snake Project

Pacific Northwest Power Co has asked the Federal Power Commission for permission to develop 1,446,000 kw on the middle Snake River through a $210-million investment of private capital.

The Pleasant Valley Dam (sketch above) is the largest of the two projects included in the company's overall development plans. Rising 534 ft from the bed of the river, the dam will produce 1,014,000 kw. It will be located ten miles southwest of Whitebird, Idaho, and back water 34 miles to Hells Canyon.

Application for the license to build and operate dams at both the Pleasant Valley and Mountain Sheep sites, between Idaho and Oregon on the Snake, was filed by PNP on behalf of its four member firms—Washington Water Power Co, Pacific Power & Light Co, Montana Power Co, and Portland General Electric Co.

AEC Spurns Application by Elk River REA Co-op

The Atomic Energy Commission has rejected the proposal of the Rural Cooperative Power Association of Elk River, Minn., for a government-financed 22,000-kw nuclear reactor.

AEC officials said objections to the design were technical. For instance, Elk River asked AEC to manufacture fuel elements, contrary to AEC policy. The agency wants private firms to make fuel elements; several such fuel fabrication plants are planned.

As in the case of Consumers Public Power District and Yankee Atomic Electric Co, however, the way was left open for revision of Elk River's proposal. This may mean that the co-op may resubmit its plan to qualify under the small-reactor power demonstration program.

Elk River had asked AEC for a loan of $1.5 million. It also planned to borrow about $3 million from REA.

O'Mahoney Probes Merger

(*Continued from page* 81)

O'Mahoney's contention is that, with such representation, owners of isolated shares of stock would have someone at the management level to whom to appeal without being supplied only with management's viewpoint. He feels this is particularly important in situations involving proxy fights, when minority stockholders band together in stockholders committees.

Parrott Was Key Witness

As Washington Water Power's consultant, Parrott was O'Mahoney's key witness. The subcommittee chairman was out to determine whether Parrott tried unduly to press home the merger.

Parrott said he had not. He said he worked, not only for Washington Power, but for Montana Power Co, Kansas Gas & Electric Co, and Pacific Power & Light Co, all at the same time. Under such circumstances, he said, he could not devote too much of his time to the problems of only one client.

Merger Advice Was Independent

Furthermore, he testified that his advice to Robinson on the merger was made on his own hook and was not dictated by Gardner or any other Ebasco official in New York. Gardner corroborated this.

"His responsibilities were to his client," Gardner said of Parrott. "He was on his own to do what he could to help solve whatever problems his client had."

Walker, too, denied having had with Parrott the types of contact hinted at by O'Mahoney. He declared flatly that "there is no control" by Electric Bond & Share Co over operating electric utilities. And he pointed out that his company divested itself of electric utility stocks pursuant to the Holding Company Act's provisions.

McLaughlin Testifies

Puget Sound P&L's Pres Frank McLaughlin admitted that he had favored the proposed merger with Washington until 1953 when Puget's financial outlook took an upturn. Since that time, he said, he has opposed the merger and fought what he considered was a stockholders committee "acting in utter disregard of Puget Sound."

O'Mahoney wrapped up his hearings on the power company merger, but he plans to continue investigating Ebasco. His next round will concern Ebasco's role in Pacific Northwest Power Co—a four-company organization formed along super-cooperative lines by Northwest utilities to construct hydro projects too big for any of the individual firms to handle. Parrott is secretary of this company, serving without pay, and O'Mahoney will call him in again.

O'Mahoney will now switch from his position of acting chairman of the antitrust subcommittee to that of acting chairman of the Senate Interior Committee (EW, Sept. 26, p 10). As such he will take up the Pacific Northwest Power Co matter and Ebasco's part in Idaho Power Co's development of the Hells Canyon stretch of the Snake River.

Future fall action on the political power front also will include the following: Rep Earl Chudoff (D-Pa.) will continue his probe of the Administration's policies with testimony from Interior Department witnesses, and Sen Estes Kefauver (D-Tenn.) has promised to resume his investigation of the Dixon-Yates contract.

State Committee Probes Santee-Cooper Finances

Financial difficulties of South Carolina Public Service Authority (Santee-Cooper) were probed in hearings before a state legislative committee recently. The program for the current investigation was drafted last June (EW, June 27, p 91).

Attention was focused on a $15-million steam plant and a $1-million office building. The power plant exceeded estimates by $1.5 million; the office building, by $300,000.

At Columbia, S. C., hearings Santee-Cooper's operating deficit was attributed to "bad estimates" and "bad control" during plant construction.

Also hit as a cause of its troubles was a 35-year contract with Central Electric Power Cooperative, Inc. The 16-member "super co-op" pays 6 mills per kwhr for Santee-Cooper power. "Some of the Authority's troubles," General Manager R. M. Jeffries observed, "derive from an eagerness to supply worthy people with power at a little less than it costs to produce."

Blamed as additional, unforeseen costs were last year's Hurricane Hazel, $250,000; last year's drought, $800,000.

The committee met again Sept. 29 for a two-day session.

NSP Trys Waste Coal as Road Builder

Waste fly ash, a residue from burned coal, is being tried out as a road-topping base by Minnesota's Northern States Power Co. A section of road on which fly-ash experiments are being conducted is shown above.

The residue coal is mixed with lime, soil aggregate, and water before it is spread as a base course. Hennepin County and Minnesota State Highway Department are cooperating in the experiments which involve laying the fly-ash mixture in varying thicknesses along a 1,500-ft stretch of county road.

Key Figures Argue For and Against

PRO { A. M. Beebee, President, Rochester G&E: • State and private plans are virtually alike • Private enterprise taxes assist state, federal governments • Tax-free government projects violate American principles

Alexander M. Beebee, president of Rochester Gas & Electric Corp, recently presented the case for private development of the Niagara River. As an official of one of the five utilities which have submitted a joint proposal to produce power from the U. S. share of the river waters, Beebee is deeply concerned with the issues involved. Writing to the New York Herald Tribune, he said:

"It seems to me that the reasoning . . . used in support of private enterprise in the Hells Canyon controversy should apply with increased emphasis to the 'Niagara issue.' Since Niagara is in a fully developed area, there is no justification for subsidization in order to compete in the national economy. There is no navigation nor irrigation involved—it is purely a case of the State being in the power business with tax-avoiding operations.

"At Niagara, private enterprise for years has carried out all the development for power on the American side to the extent that the then treaty with Canada would allow, and has paid annually into the state treasury some two million dollars for 'water license fees' along with all other taxes, local, state, and federal. For over 30 years the private utilities have urged additional diversion of water for power purposes, which the new treaty with Canada in 1951 now makes available and which would involve 'water license' fees to the state of some $5 million annually plus all other usual taxes.

Private Development Stymied

"When the new treaty became effective, of course the private utilities instantly indicated their desire to make this development, and bills for that purpose were promptly introduced in Congress. However, the New York State Power Authority and the federal government also expressed a desire to carry on this development by methods that are substantially identical with those originally proposed by the utilities. Bills in favor of 'private enterprise' passed the House at the last Congress but were stymied in the Senate. . . .

"We must bear in mind that even under the very favorable present business and economic conditions the state has had to increase taxes in order to balance its budget, and the federal government has not been able to balance its budget. The continuance of this deficit can only lead to further inflation and loss of purchasing power of each individual's income. It is therefore vital that we do not add to the groups avoiding their fair share of the tax burden.

Utilities Carry Tax Burden

"Some 85% of the country is supplied by Private Power Companies, and in the State of New York over 95% of the customers are supplied by such companies. These private power companies, of course, carry a terrific burden of taxes in their operating costs. These taxes, of course, can only come from the customers supplied.

"Areas which are supplied by public power programs avoid both state and federal taxes, and thereby enjoy an unfair advantage in the national markets as compared with the tax-paying areas, and these tax-paying areas must carry more than their full share of the tax burden in order to make up for the lost taxes in public-power areas.

Tax Freedom Unfair

"In the early days, this privilege of tax avoidance by certain groups started out in undeveloped areas in order to help them to compete in the national markets. At that time, these 'special privileges' were not so detrimental in their effect. . . . Taxes were then low and these areas tended to exist unto themselves. However . . . taxes that formerly were a small portion of the cost of things have both grown and multiplied and now constitute a tremendous burden on enterprise and development in the taxpaying areas. As a result, tax-avoiding areas not only compete unfairly with other areas in the national markets, but also entice industries and people from other areas. It also leads to creation of business ventures that are uneconomic and that could not be financed by orthodox means and must depend on tax exemption for their existence. . . .

Public Power not Taxed

"Perhaps the most unfair situation attached to public power programs is that they not only avoid taxes in their operations, but in the sale of power they give 'preference' to groups of customers who also avoid taxes. I am sure you will agree this is most unfair and un-American. . . .

"We believe in treating everybody the same. Under private-power operation regulated by the Public Service Commission, this objective is automatically achieved since the operations are carried on in the public interest on a 'cost of service' basis in which there is no profit as the word 'profit' is ordinarily understood. Under these conditions, the 'people benefited' are paying the cost of the benefit and their fair share of the tax burden, as well as obtaining their electric service at the lowest real cost.

Where Will Tax Avoidance Stop?

"It seems to me the time has come in this country when we must begin to support the principles of fair play. . . . If the principle of tax exemption is to become established in a fully-developed area like New York State, then every other state in the Union is entitled to do the same thing. Where will tax avoidance stop, and where will needed taxes come from?

"The issue at Niagara is therefore not a local one but one of national importance. It is for all these reasons we feel very keenly that great fundamentals are at issue, and we must think clearly before we may set a pattern that can be very detrimental to the American Economy which has done so much for so many."

Private Development of Niagara River

CON — Robert Moses, Chairman, N. Y. State Power Authority:

- Private project would be a giveaway of state resource
- River bed and rights to use waters are state property by law
- Authority could produce cheaper power for N. Y. citizens

Robert Moses, outspoken chairman of the Power Authority of the State of New York, has been plugging hard for Congressional authorization of his agency to develop the Niagara River. In a letter to the New York Herald Tribune, answering Beebee's correspondence (see preceding page), Moses stated:

". . . President Eisenhower's partnership policy includes partnerships with states and subdivisions of states as well as with private entities, each particular case being determined by the laws of the area involved.

"Mr. Beebee seeking to influence Niagara legislation, harps on the tax angle, and completely ignores the fact that to allow the development of the state's power at Niagara by a private corporation would be an outrageous gift to that corporation. Here again are the reasons:

No Risk in Development

"Unlike the usual business venture, including the development of utility service in an area, there is no risk involved in the development of the Niagara, and the licensee would get back any money it invested. Any loss to which physical facilities were put would be covered by insurance the cost of which would be included in what the Public Service Commission would allow to be charged for the energy sold.

"The bills in Congress sponsored by Mr. Beebee and his friends provide that a license be given to 'citizens of the United States, or to any association of such citizens or to any corporation organized under the laws of any state . . .' Congress has been told that an application for a license would be made by a corporation, the creation of Consolidated Edison Co of N. Y., Inc, Niagara-Mohawk Power Corp, New York State Electric & Gas Corp, Rochester Gas & Electric Corp, and Central Hudson Gas & Electric Corp. The boys who control those five companies will, of course, control this new presently non-existent and shadowy corporation.

"On June 16 of this year, I wrote Mr. Hudson R. Searing, president of Consolidated Edison, asking him whether this Frankenstein had actually been established, who owned the stock, who are its officers and directors, who had put money in and how much. His reply evaded the questions. Anyway, no corporation has yet been organized and no money invested, which Mr. Searing lightheartedly indicated was a mere matter of 'legal mechanics.'

One-Shot Deal

The new Niagara power constitutes a one-shot deal. The private corporation which would perform the development would have no other power facilities, would own no distribution lines, and would merely sell its output to other corporations. Hence, that corporation would have a great natural resource turned over to it, not as an incident to other business carried on by it, but as a single and unique venture.

Many Workers not Required

"Nor would the completed project require for its operation and maintenance the employment of a large number of workers. The Hydro-Electric Power Commission of Ontario operates similar facilities on the Canadian side with one chief operator and 28 men (seven on each four shifts), plus a maintenance force totaling not more than 50 men. Hence, it cannot honestly be argued that the development should be put in the hands of a private corporation to avoid building up a huge bureaucracy of civil servants.

"President Eisenhower's partnership policy was designed by him to conform to state law. By state law there has been set up here a public benefit corporation . . . the Power Authority . . . which is already engaged in developing the use of the same water on the St. Lawrence. The bed of the Niagara and the rights to use its waters are the property of the state. Neither Congress nor any one else has a right to turn them over to Mr. Beebee and his chums. State law mandates their development by the Power Authority.

Financed by Prudent Investors

"If the Authority is allowed to develop them, it will do so with money received from the same sources as the money which Mr. Beebee's corporation would use, from prudent investors, and the Power Authority would borrow the money without any pledge of government credit. This Authority . . . would sell power for less than 3 mills, while Mr. Beebee's corporation would charge upward of 4½ mills a kilowatt hour at the bus bar.

"Mr. Beebee . . . says tax-avoiding areas not only compete unfairly with other areas in the national markets but also entice industries and people from other areas. Isn't New York State entitled to protect its own interests and those of its people? Shouldn't the people in the Buffalo-Rochester area be entitled to cheap power just as much as the people in the Tennessee Valley and the Pacific Northwest?

Delaying Tactics Waste Waters

"Mr. Beebee's group has no chance whatever of getting favorable action from Congress and their delaying tactics merely have the effect of allowing Niagara's waters either to go to waste or to be used by Canada. . . .

"Our duty by law is to hang on to the state's rights in the Niagara River and to develop additional power there consistently with preservation and enhancement of natural beauty. This we shall certainly do. We could be impeached if we didn't. At worst we face delay. We shall not lose in Congress. We can't lose in the Supreme Court. Meanwhile we have the St. Lawrence."

The Ten Essential Traits

1. Analytical ability: His ability to think a problem through, clearly and logically, and to establish clear-cut objectives.

2. Creative ability: His gift for creative and imaginative thinking.

3. Initiative: His capacity for original thinking and initiating action.

4. Perseverance: His ability to maintain objectives in spite of difficulties.

5. Industry: His degree and effectiveness of effort in achieving objectives.

6. Judgment: His ability to arrive at wise decision with due regard for timing and cost.

7. Dependability: His soundness of character, accuracy and reliability.

8. Personality: His ability to get along well with people.

9. Leadership: His ability to organize and inspire the action of others.

10. Loyalty: His constructive attitude toward associates and his company.

Ten traits of engineers must be considered so that . . .

Personnel Rating Can Be Worthwhile

H. E. CRABTREE, Engineer, Administrative Service, General Electric Co, West Lynn, Mass.

A well-planned system of reviewing and rating performance enables management to select and develop engineering manpower in a manner beneficial to both employer and employee. Such a rating system, properly administered, accomplishes a number of worthwhile objectives.

Benefits From Ratings

For the engineer such systematic rating is an inducement to self-examination and critical weighing of valid suggestions for improving his relative standing in the company. For management it provides the basis for a sound and dynamic system of salary administration. It benefits engineer and company by pointing out to management where the engineer should be placed in order that the company can have the full advantage of all his talents.

As one company official has pointed out: "Management should provide a rating and individual analysis procedure which will serve as a guide both to the company and the individual to help in determining the individual's present and future progress."

Such a procedure enables management to single out engineers who show exceptional talents worthy of extraordinary development. It also provides a means of measuring the relative talents of all engineers in the company so that each can be encouraged and helped to improve his effectiveness to the limit of his native qualities and abilities.

Effective Rating Sheets

Many forms of rating sheets have been used successfully by industry in appraising the performance of engineers. Continual development keeps the form and appraisal technique up to date with the latest philosophy of engineer-management relations. Two forms of rating sheet that have proved effective in measuring engineers are based upon the following:

1. Relative evaluation of a number of important traits or qualities,

2. And more recently, appraisal of performance relative to specifically defined current work assignment.

In addition to the usual professional education and the practical work experience required for a particular position, it is generally agreed that an employee's value depends upon the ten, more or less, traits or characteristics listed separately in the box above.

An engineer's relative rating on each of these traits can be made on a scale varying from superlative to unsatisfactory. It is doubtful whether this spread of ability can be divided with any significance into more than five or six degrees. Terms such as "outstanding," "excellent," "good," "fair," and "poor" have been used. A rating on such a basis helps to answer the question: "What kind of a guy is he?"

Methods Compared

Rather than attempt to measure an engineer's overall value and potential by his relative rating on a given number of attributes, a second type of rating sheet appraises his performance in a specific position by answering the question, "How well does he . . .?" as applied to definite requirements of the position. A requisite of this method is a well-defined description of the position, called a position guide, against the demands of which the engineer can be appraised. By this

method, an overall performance factor may be determined which is helpful in salary evaluation and in optimizing for management the engineer's position assignment.

Formulating Questions

As many as 35 questions on four broad aspects of the engineer's position have been formulated. A typical question might be, "How well does he solve problems and overcome obstacles?" Such a question gauges the engineer's perseverence. "How well does he recognize opportunities for improvement and initiate action?" is a yardstick of initiative. "How well does he analyze cause-and-effect relationships from available information?" is closely associated with the engineer's analytical ability.

Rater's Opinion Important

Many questions have a direct bearing on the ten basic traits previously mentioned, and each question should help the rater to make a fair and complete evaluation of the engineer's performance. The rating sheet should include the rater's opinion of the engineer's growth potential in his present job compared with other work for which he might be better suited.

General comments, especially helpful suggestions for self-improvement, are perhaps the most valuable information on the rating sheet. All raters should be encouraged to make full and complete comments, particularly in explanation of a low rating on a certain trait or performance aspect.

As axiomatic with all working personnel, an engineer's progress path, or rate of climb, is usually established rather early in his professional career and levels off as he approaches his ultimate level or maturity. Consequently, the change is greater between an engineer's tenth and eleventh rating sheet than between his twenty-fifth and twenty-sixth. Changes between his second and third may be and sometimes are quite pronounced.

Interval Between Ratings

Some organizations rate annually engineers with five years' service or less and those with more than five years' service at least every three years. More frequent rating is called for when an engineer has a new assignment or vastly improved performance indicates an awakened attitude or, conversely, when the deterioration of his performance required confirmation by another group of raters before corrective action.

There are advantages, however, in rating all engineers every year. It avoids giving older men the impression that they are being taken for granted and affords them with an annual challenge to turn in better performances. It provides management with continuity of data for statistical study and more points for correlation with an individual's typical learning curve.

Reading Curves

In the latter curve, apparent growth shows periods of leveling out between periods of much more rapid growth. It is important that management not confuse these temporary slowdowns between spurts with a permanent leveling off attributable to failing interest or deterioration such as is sometimes apparent in older employees nearing retirement age.

Function of Supervisor

Obviously, the opinion of the engineer's supervisor is most important. When a supervisor feels he is unable to observe an engineer's performance fairly under a reasonably broad set of conditions, he should appeal to colleagues in other functions of the company to submit their appraisal of the man. The supervisor, in any event, should be in agreement with the individual comments on final reports. Such comments must be presented to the engineer as a fair evaluation of his performance by his own supervisor.

Efficiency of Raters

Raters must be trained and have adequate time for a thorough job, particularly for formulating suggestions. Raters are not exempt from the common human tendency to stress the higher rated traits in their comments, and too often they give an engineer an unusually low mark on one trait without explaining their reasons.

As a primary function of the rating sheet is to provide data for salary evaluation, every engineer is curious about his standing in relation to others in his organization. Two methods of determining his relative position and his strong and weak traits that have been used successfully are:

On the rating sheet appraising his traits, each graded in four degrees of quality, an index is derived, as shown on top of p 88. His best possible score is 5.00 and his worst, though hardly conceivable, is 0.00. Any of the 60 engineers appraising this chart would know the relative quality of his current rating sheet when told his index during an interview.

By comparing his rating sheet with the trait profile (p 88), an engineer can determine his relative standing on individual traits. He can see that a rating of "excellent" for analytical ability is about average while same rating for creative ability is above average.

Value of Interviews

All supervisors should assume the important responsibility of arranging timely interviews with their engineers to discuss each rating sheet. During such an interview, dealing with his entire professional career, his rate of progress with the company, and his personal sense of accomplishment, the engineer deserves complete privacy and the undivided attention of the supervisor.

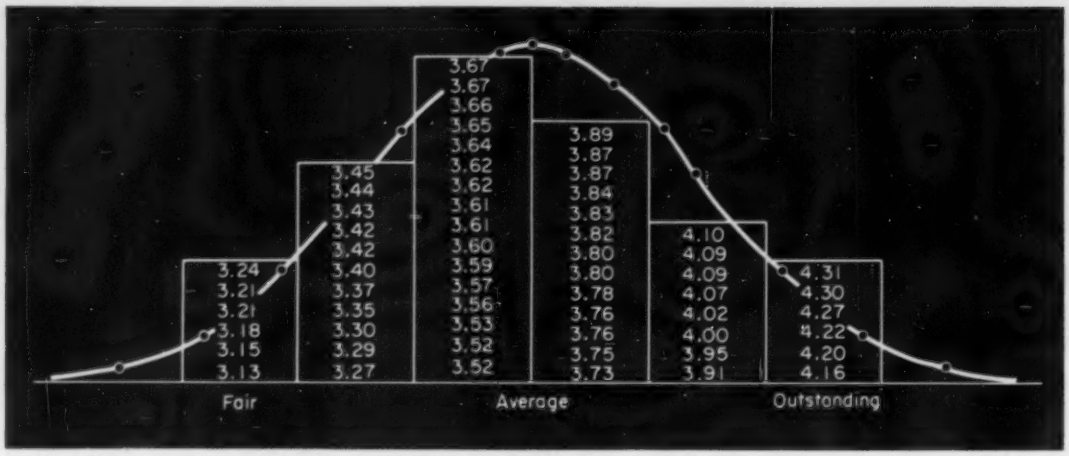
Conducting the Interview

The engineer should be encouraged to carry the discussion and establish his own timing. No definite period is allotted. When more than one interview is requested, he should be made welcome—it's his show. When he asks for a discussion at a higher level of supervision, it should be arranged quickly and graciously. Whenever practicable, the engineer should be shown the two most recent rating sheets in order that comparisons may be noted and trends pointed out.

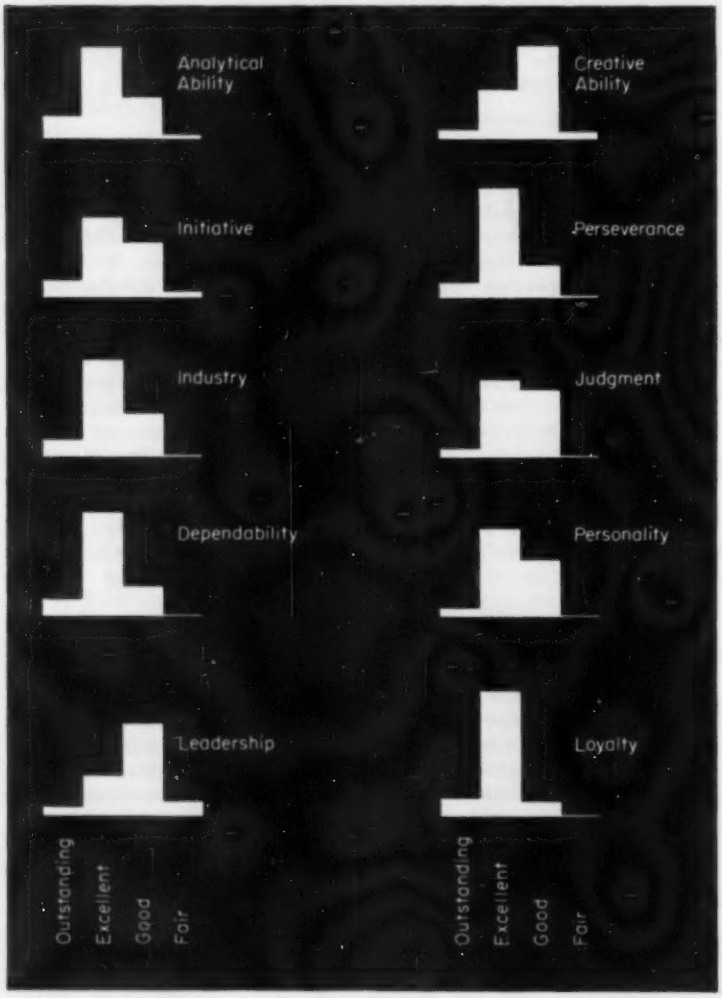
An engineer who has never seen a rating sheet before should be given an explanation of how the rating system works and its purposes. It should be pointed out to him that he is responsible not only for what he is but also for what other people think of him. It should be stressed that the primary purpose of the rating sheet is to enable him to improve his performance and standing and assist him in his own self-development. It should be stressed that the rating sheet aids the company and himself by supplying data for the fair and impartial transfer and promotion of engineers and to enable supervisors to place and keep personnel on assignments for which they are best qualified.

Keeping Personnel Happy

Occasionally discussions develop which lead to changes in type of work or personnel, with consequent improvement in the individual's peace



DISTRIBUTION of rating sheet indexes for 60 engineers looks like this. Engineers were graded in four degrees of quality, best possible score being five



PROFILES OF RATINGS on ten traits are shown for 60 engineers. Individual can compare own rating with these to determine relative standing on each trait

of mind and in the morale of the organization. In the great majority of cases, however, satisfaction probably will be indicated. The engineer's expressed satisfaction with such changes, however, should not be allowed to produce complacency on the part of the supervisor.

Plan for Transfers

A definite plan of transfers within the organization should be in operation at all times. It should call for rotation of assignments for younger engineers to allow them to broaden their experience and present them with new challenges and problems. Interchanging personalities and ideas between units can have good results for the individual and from previous experiences could lead to greater benefits to his organization.

At the interview's conclusion it is good practice for the interviewer to prepare a summary of the discussion for attachment to the rating sheet as part of the permanent confidential personnel file on the engineer. The summary should include pertinent comments of the engineer, observations of the interviewer, any commitments made, and recommended action for improvement.

Handling Marginal Cases

Supervisors must be able to determine marginal cases from rating sheets, supplemented by other observations, and must have the courage to make changes indicated. A "wait-and-see" attitude, maintained too long, is detrimental and unfair to the engineer and company.

Serves 104-Home Unit Cooling Load

DISTRIBUTION
Design

Los Angeles Department of Water & Power resorts to paralleled secondaries and banked transformers for blanket installation

FLOYD L. GOSS, Engineer of Overhead Distribution,
H. A. SCHANBACHER, Staff Engineer, Overhead Distribution,
Department of Water & Power, Los Angeles, Calif.

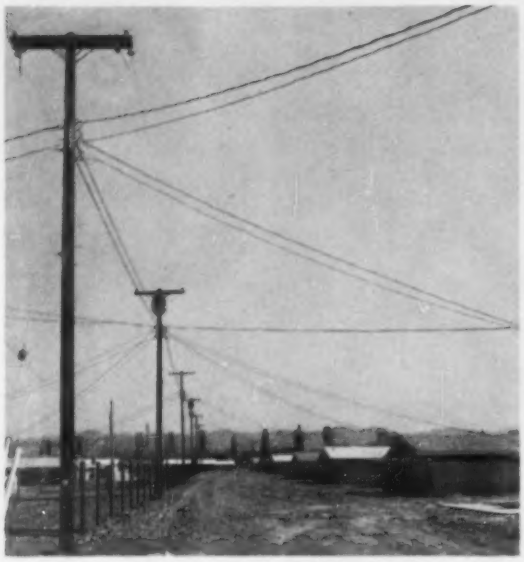
Blanket installation of large central air conditioning units in new housing developments has presented new problems to the distribution engineer. To satisfy these demands, Los Angeles Department of Water and Power has turned to paralleled spun aluminum secondaries and banked transformers.

The initial construction was applied to a development in the San Fernando Valley. The tract consists of 104 homes, each equipped by the builder with a 3-ton central air conditioning unit, garbage disposer, and two 1.65-kw heaters in bathrooms. Winter heating will be supplied by a central gas furnace with a fan blowing warm air through the cooling air duct system. It is expected that half the homes will be equipped with electric ranges by the owners.

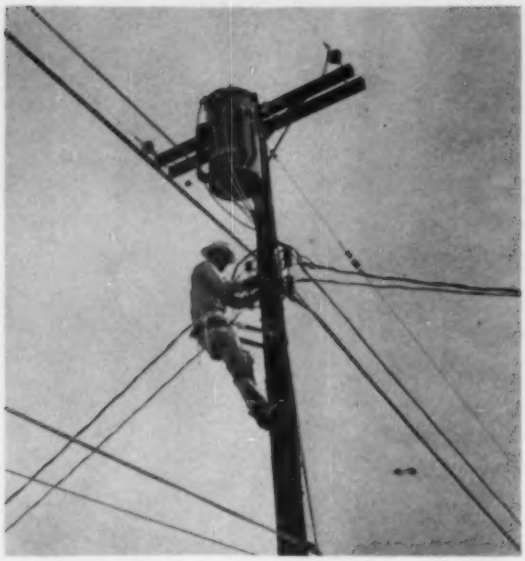
All homes will have the normal complement of appliance and lighting loads. Additional load is expected following the building of swimming pools in the backyards, a number of which already have been installed. Prices of the homes range between $18,000 and $25,000.

Serving the 104-home tract is a 3-phase, 4.8-kv primary with four single-phase laterals of No. 6 bare copper con-

(Continued on next page)



OVER 54 SERVICES drop from 7-pole lead. Three 37.5-kva transformers are in parallel on primary, secondary sides



ONE SET OF LEADS is run from the distribution transformer to the lighting (upper wire) and to the power secondaries

Initial Installation at San Fernando Valley Development

(*Continued from previous page*)

ductors. All laterals but one serve two rows of houses. All poles are set on rear property lines. Two of the laterals have three 37.5-kva transformers; one has two 50-kva transformers; and the fourth, which serves but a single row of houses, has two 37.5-kva units. Transformers in all laterals are paralleled on both primary and secondary sides.

Transformers Standard

Transformers are standard distribution types, not self-protected. Each lateral is fused at the point where it takes off from the 3-phase primary. The two 112.5-kva and the 100-kva laterals are fused 50 amp while the 75-kva lateral is fused 40 amp. Faults are expected to clear within consumers' premises, burn clear on the lateral, or open the line at the lateral fuses. Experience with paralleled transformers dating back to 1937 was the basis upon which this method of protection was selected.

Under each primary lateral the department has installed two spun secondaries. One is for lighting and other voltage sensitive loads and the other for all power equipment. The lighting secondary consists of a bare No. 2 ACSR neutral used as a messenger and two No. 2 all-aluminum conductors covered with 4/64-in. insulating grade Neoprene.

This secondary is placed in the top spool of a four-spool rack.

Spinning Methods Tried

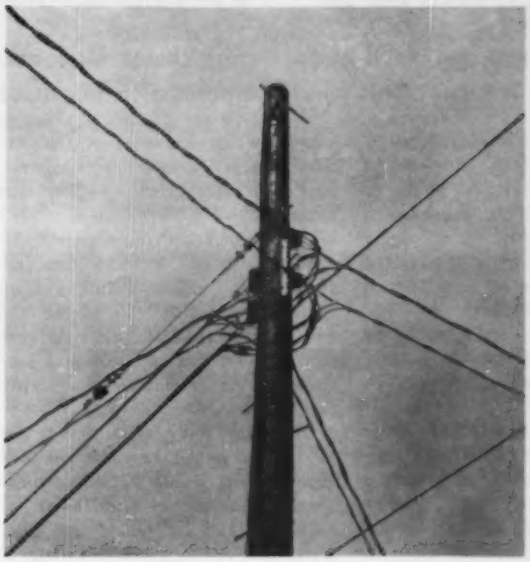
The power secondary consists of a bare No. 2 ACSR neutral used as a messenger and two 2/0 all-aluminum conductors with 4/64-in. RHRW (heat and moisture resistant) insulation covered with a 2/64-in. Neoprene jacket. This secondary is placed in the bottom spool of the rack. Covered conductors are spun to the messengers with 0.091-in. aluminum-alloy spinning wire. These power and lighting secondaries are tied together and connected to the secondaries of the transformers of each lateral.

Two different methods for spinning the cables were tried —on the ground and in place on the poles. When spun on the ground, the ACSR messenger was positioned along the line of poles about 3 ft off the ground and pulled to tension. Conductors then were spun to the ACSR. When completed tension was released, and the cable installed and tensioned in its permanent location. In aerial spinning the messenger is pulled to tension in its permanent position and the cable spun directly to it. Based on this trial it appears that spinning with the messenger in permanent position is to be preferred.

ACSR Messenger Protected

During spinning operations the covered conductors were removed from the spinning machine at each pole. A loop was formed for the service taps, and the conductors were replaced in the machine after it had advanced beyond the pole. This provided room to tap a pigtail for service drop connections. The only connections made directly to the secondaries were transformer taps and the pigtails.

Precautions were taken to prevent damage to the ACSR messenger where it tied to each spool. A preformed deadend of proper size was looped into the spool and wrapped around the ACSR messenger 8 in. each way from the spool. This proved to be a simple and adequate tie wire and the equivalent of a wire guard at each rack. Standard sleeve-type deadends for ACSR were used at each end of the laterals. All connectors used in this tract



NEUTRALS deadend on rack. Pigtails run around pole, clearing climbing space, and service taps on them are staggered

DUAL SERVICES through roof of house wired for a range are one No. 2 triplex all-aluminum (nearer), and one No. 2 ACSR

were of the compression type and were covered with a moisture and oxidation resistant seal and taped.

Aluminum Triplex Used

Generally, eight sets of services were run from each pole, four light and four power, one pair to each house. One four-spool rack and one two-spool secondary rack were installed on each pole for service attachment. Aluminum wedge-type clamps with stainless steel bails were used to deadend the ACSR messengers of power and light service drops on these racks and at the houses. The light service drops were deadended on the top spool of the two-spool rack and on the second spool, just under the light secondary of the four-spool rack. The power service drops occupied the remaining spools.

The two service drops were aluminum triplex. One consisted of two No. 6 all-aluminum conductors covered with 4/64-in. insulating grade Neoprene and one No. 6 bare ACSR 6/1 neutral messenger. The other was made up of two No. 2 all-aluminum conductors covered with 4/64-in. insulating grade Neoprene and one No. 2 bare ACSR 6/1 neutral messenger.

Drops Made on Pigtails

For homes not expected to have ranges, service drops for both the power and light circuits are No. 6 triplex. For those that were to have ranges, No. 6 and No. 2 triplex service drops were installed. All taps for service drops were made on the pigtails. As there are 24 taps for service drops at each pole, extreme care had to be used to spread them in the proper manner to avoid possibility of contact and failure.

Connections to service-entrance conductors at the service heads were made with aluminum tube-type connectors. These contained an oxidation-inhibiting grease containing grit particles to break the aluminum oxide film on the conductor. A hand tool was used to make the indents on these connectors.

Plans Future Designs

After the connections had been made, they were covered with a flat piece of moisture-and-oxidation-resistant seal and taped. Then the copper entrance service conductor was bent to place it beneath the aluminum service drop conductor to avoid corrosion of the aluminum. Both power and light services terminate in an eight-clip, dual-element, 15-amp extended-range kwhr meter.

To gather data on the over-all demand, diversity, and consumption, the department has installed recording instruments in the 4.8-kv 3-phase primary serving only this tract. These instruments include a graphic block-demand meter with a 15-min interval, a kwhr meter, and a graphic meter. The present plans call for the test to run for one year.

Neutral May Be Added

From the standpoint of electrical design as well as choice of material, tools, and methods, this scheme of distribution is considered a trial run for this kind of residential load. For example, a system currently being designed will use No. 1/0 aluminum for the power conductors. Consideration also is being given to the use of a neutral in addition to the messenger.

Different connectors and tools are also under study by engineers of the Los Angeles Department of Water & Power.

Experience gained in the construction and operation of these first systems will affect plans for future systems in residential tracts with like load characteristics.

New H-Frame Design Cuts Cost

TRANSMISSION
Design

Double-plank, truss-arm, wood-pole structure chosen for Southwestern Public Service's contemplated transmission backbone

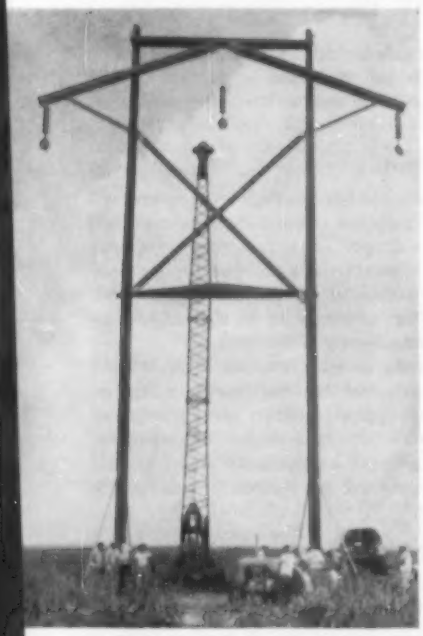
C. W. GRAGG, Chief Engineer, Transmission Design, Southwestern Public Service Co, Amarillo, Texas

First use of the new double-plank, truss-arm design for a wood pole, H-frame structure is being made by Southwestern Public Service Co for its contemplated 230-kv backbone transmission system. Compared with two conventional designs for 230-kv, H-frame lines, the new design offers a 6.7% saving overall. Figuring in this saving is the use of an 800-ft ruling span and Class 3 poles. And savings in field labor are expected to follow the use of timbers less than 22 ft long for arm members and less than 28 ft in length for the structure's X-brace.

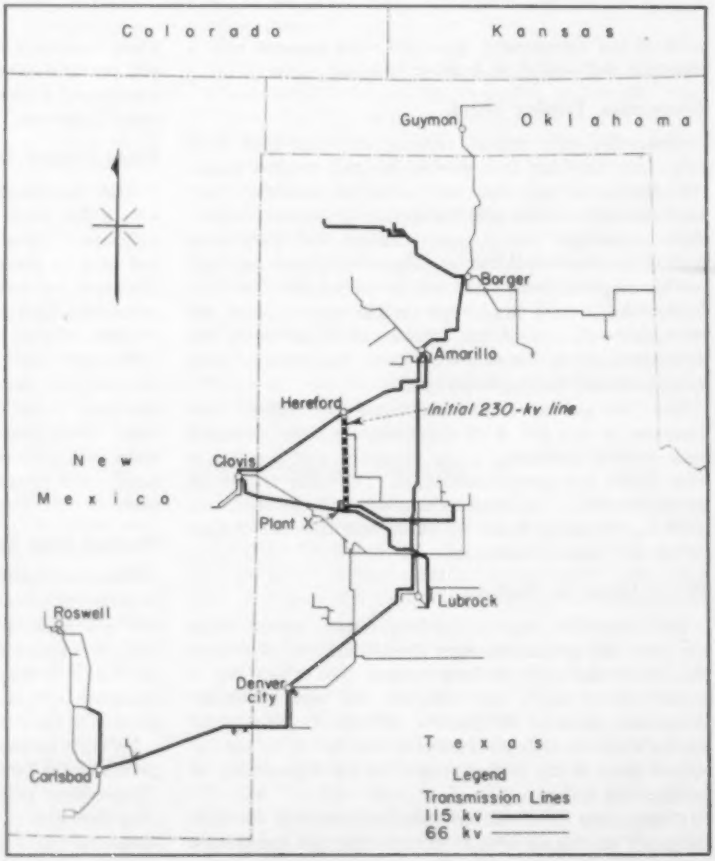
Selection of the truss arm design is the latest effort by Public Service to provide an adequate transmission network for its service area which stretches about 500 miles through the southeastern portion of New Mexico and up through the Texas and Oklahoma Panhandles. Load growth has been from about a 90,000-kw peak in 1943 to an estimated 1955 peak of 525,000 kw.

The present transmission system is essentially a 115-kv backbone with looped 115-kv circuits carrying the heavier loads in the central portion of the system. All 115-kv lines are of H-frame shielded construction, operation of which has been satisfactory. The tendency toward larger centralized generating plants, coupled with expected load growth, however, dictated consideration of a higher transmission voltage. Network analyzer studies and economic line loading studies pointed to 230 kv on the basis of expected loads while showing that 138 or 161 kv did not offer adequate margin of load-carrying ability over 115 kv.

Although 230-kv operation will not be required immediately, certain strategic sections of line will be built for conversion to 230-kv after initial operation at 115 kv. One line section about 45 miles long between Plant X



DOUBLE-PLANK, truss-arm, H-frame selected for planned 230-kv backbone



FIRST LINE in 230-kv network will run 45 miles, from Plant X to Hereford

# of 230-Kv Transmission Line

and Hereford, Texas, logically fits into plans for a 230-kv network.

Phase Separation 20 Ft

Conductor chosen was 795-MCM, (26/7) ACSR, the minimum size as selected from corona-loss calculations and of adequate size to carry future loads economically. Two ⅜-in. EHS galvanized steel static wires will provide shielding. Strong winds prevailing seasonally and the need for a high impulse strength because of severe lightning conditions prompted selection of 20-ft phase separation. In addition to NESC heavy loading conditions, the line is designed to withstand 1 in. of ice and a 4-lb wind with a safety factor of 4.

For economic reasons, the longest practical spans were dictated. The line, however, will traverse a relatively flat and intensively irrigated farm area subdivided into sections. The many rural roads have the us complement of distribution and phone lines along them. Thus, spa length should divide equally into 5,280 ft so as to place a structure adjacent to each road for improved clearance. This requirement had a major influence on final design.

Basically, three types of wood construction were considered for the 230-kv network for several reasons. Among these are the company's excellent operating record with shielded, H-frame, 115-kv lines, rather general acceptance of wood construction for 230 kv, and the lower cost of wood over steel revealed by preliminary estimates.

The first type was essentially an expanded H-frame with K-braced arm and shield wires carried on ridge-irons. A slight revision of this framing supplants the inside K-braces and ridge-irons with an angle-iron to carry the shield wires. Structurally and cost-wise these two are quite similar and will be called Type A.

Laminated Arm Considered

Because arms in this framing would be about 42-ft long, normally warranting premium prices, laminated arms were considered. A double-plank laminated arm proved slightly more costly than an equivalent solid plank arm, but a single-timber laminated arm would cost slightly less.

Disadvantages of the single-timber arm—eccentric loading, susceptibility to complete failure when struck by lightning, and lower longitudinal strength—outweighed the slight cost advantage. Furthermore, lack of experience with laminates in a relatively dry atmosphere helped decide against them, at least until experience can be gained.

The second framing, Type B, consists of so-called spar-arm construction. The arm considered was a full-length treated, 42 ft, Class 2 spar, machine peeled but not turned to uniform dimensions. All brace members are round section with attachments of malleable iron fittings and single bolts insofar as practicable. Anti-split devices were proposed in each end of every member.

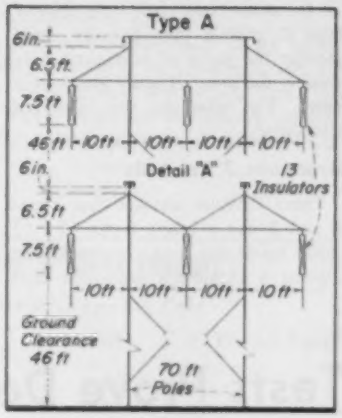
Disadvantages of type B are eccentric loading, apparent additional costs of framing a structure with a large number of bolt holes to be field drilled, and the rather large amount of loose hardware to be assembled.

Timbers 22 or 28 Ft Long

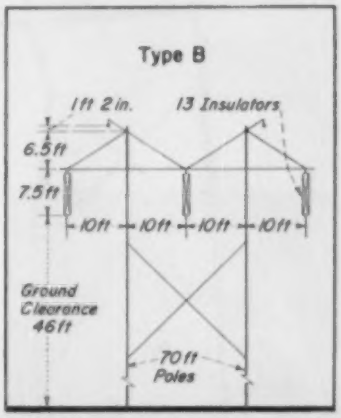
The third framing, Type C, is a double-plank, truss type design proposed and tested by Hughes Brothers, Seward, Neb. (See accompanying test data). It uses timbers less than 22 ft long for arm members and 28 ft long for the X-brace. Because such lengths are readily available in quantity, Public Service engineers have studied the design and tests very closely.

Preliminary transmission circuit designs were based on a conductor design tension of 33% of ultimate. At this tension, adequate ground clearance could be maintained with 70-ft poles in Type A or Type B framing. Although Type C required 75-ft poles, it provided an additional 2.5 ft of ground clearance. These clearances were for a ruling span of 700 ft, because the normal span worked out to about 660 ft, or eight structures per mile.

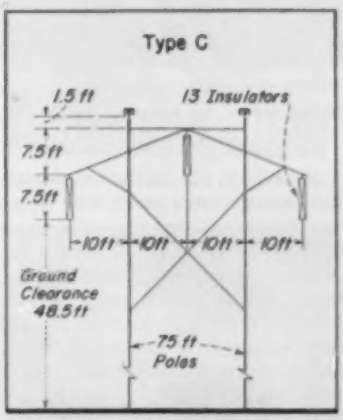
Structural calculation proved the need for Class 2 poles for Types A and B. Class 3 poles were adequate for Type C. It should be noted that company engineers were unable to find test data conclusively proving that framing similar to Type A or Type B adds sufficient rigidity to move the point of maximum fiber stress to any



TYPE A takes 43-ft arm. Inexperience in dry area ruled out laminated arms



TYPE B employs 42-ft Class 2 spar. Needed framing, hardware are costly



TYPE C has timbers 28-ft or shorter. Saves 6.7% over second best Type B

point below the top X-brace attachment. Therefore, these structures were analyzed by generally accepted formulas covering X-braced H-frames. On the other hand, full scale tests of Type C proved that framing could transfer the point of maximum fiber stress to the lower X-brace attachment point. The structure was analyzed accordingly.

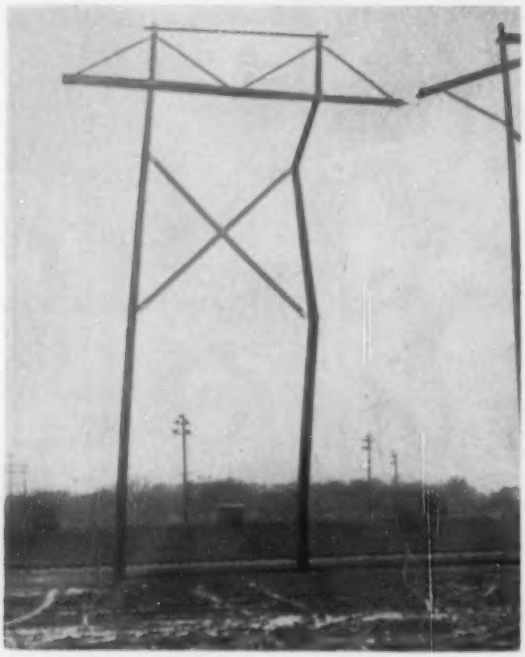
Structures 7 Per Mile

These analyses showed that Types A and B had a safety factor of 3.91 under maximum load conditions and allowed a maximum allowable span length of 683 ft for a safety factor of 4. Type C showed a safety factor of 4.66, and had a maximum allowable span length of 816 ft for a safety factor of 4. These data influenced the further use of the additional transverse strength inherent in Type C and the improved ground clearance.

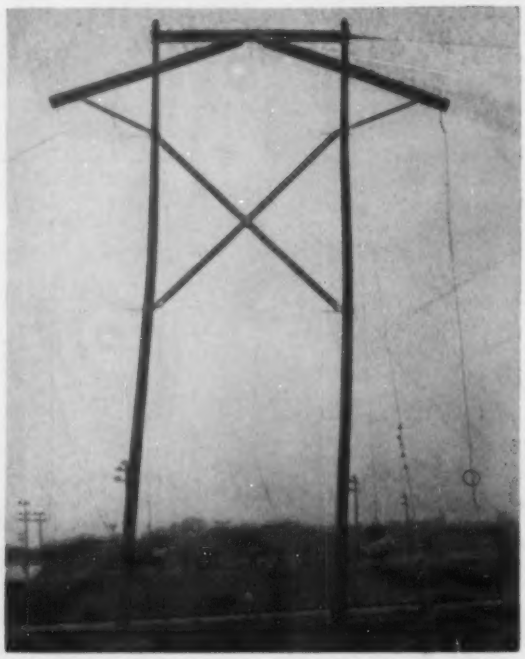
By increasing design tension to 37%, proper ground clearance could be maintained for spans up to 800 ft. With an 800-ft ruling span and maximum loading conditions, Type C showed a safety factor of 4.08. This allowed normal spans of 754 ft, or seven structures per mile, with adequate structural strength to allow spans up to 816 ft under proper terrain and control conditions.

Comprehensive cost analysis demonstrated that Type C on 75-ft, Class 3 poles, an 800-ft ruling span, and a conductor design tension of 37% of ultimate, saved about 6.7% over the nearest competitive structure. The second best was Type B, on 70-ft, Class 2 poles, a 680-ft ruling span, and a conductor design tension of either 33 or 37% of ultimate. The controlling factor in its selection by Southwestern Public Service was transverse structural strength.

Tests Prove Design's Framing Adequate*



TYPE A STRUCTURE failed under a 12,000-lb transverse load at the top of the X-brace and also at the arm attachment



TYPE C STRUCTURE withstood up to 14,000-lb transverse load at which loading the upper left-hand X-brace fitting failed

Several tests to destruction proved the framing of the double-plank, truss arm 230-kv design to be adequate. It was determined that transverse strength of the structure could be calculated on the basis of pole strength below the X-brace. As design proceeded, it was found that several minor changes were desirable. Arm timbers were reduced from 3¾x8¾ in. to 3¾x7¾ in., a single knee-brace was substituted for the original double brace under the arm, and hardware was simplified. These changes, plus consideration of the use of Class 3, 75-ft larch poles influenced additional tests.

These tests, begun at Seward, Neb., April 12, 1955, were completed in a few days. These are the major findings:

In the tests a load was applied horizontally over the boom of a railroad crane used as a stub between the test structures and the winch 280 ft distant. Structures were tamped with a graduated aggregate and used no other type of anchor.

Type A structure was loaded with 3,000 lb per phase position. The transverse load was applied in about 2,000-

* Based in part on "Report of Full-Size Structure Tests, 230-330-Kv Structures," by Ralph Yerk, Hughes Brothers, Seward, Neb., presented at AIEE Summer and Pacific General Meeting, Los Angeles, Calif., June, 1954.

lb increments. The structure failed, insofar as observers could determine, simultaneously at the top of the X-brace and at the arm attachment at a transverse load of 12,000 lb. The illustration shows the structure an instant after failure. The break at the lower end of the X-brace apparently followed the initial failure.

Earlier Tests Are Corroborated

Type C structure was loaded with 1,000 lb per static wire position and 3,000 lb per phase position. Transverse load was applied in about 2,000-lb increments. At about 10,000-lb transverse load it was decided to remove some of the vertical load to test more adequately the aggregate tamping. Transverse load then was increased. At 14,000 lb the upper X-brace fitting on the uplift pole failed. After modification of the X-brace fittings, the thrust pole failed at 16,000-lb transverse load, which compares favorably with calculated values.

To check further the modified arm assembly, a vertical load was applied to the outer phase position. At 18,400 lb the arm spacer fitting tore out the hardware attachment hole. The aggregate tamping performed very well under all test conditions.

These tests fully confirmed the decision of Public Service engineers to use the truss-type structure in the initial section of the proposed 230-kv system.

Theoretical transverse strengths of the 230-kv structure, based on 65-ft Southern yellow pine poles, are shown in the table. Also given are calculated maximum fiber stresses at failure for these poles, based on the actual deflection in previous tests. It should be noted that these poles were mismatched and of questionable quality. Thus these fiber stresses compare very unfavorably with the 7,400 lb alloted to Southern pine poles.

A third tabulation gives the theoretical safety factors for a 660-ft span using 954-MCM ACSR conductors, and 101.8-MCM shield wires loaded with ½-in. radial ice and an 8-lb wind. Safety factor on the 230-kv structure was 3.39 when it failed at 14,200 lb. This failure corroborated previous tests.

Analysis of 230-Kv Structure

	Class or Type of Pole					
	1	*2*	*3*	*4*	*Thrust*	*Uplift*
Transverse strength (1,000 lb)	23	19	15	12	..	..
Safety factor	5.96	4.56	3.75	2.5	..	..
Fiber stress (1,000 psi)	..	..	..	..	4.33	4.8
Load at failure (1,000 lb)	..	..	..	..	5.7	8.5

DISTRIBUTION—Operation

Potting Improves Connections

Electrical connections in harness assemblies are made moisture and fungus-proof in an operation called the potted-harness plug method. This operation, developed by Convair Division, General Dynamics Corp, Pomona, Calif., after two years of research and experimentation, has possible applications in other fields.

The potting method reduces operational failures due to electrical breakdown in the harness assemblies and also saves manhours and materials in the assembly of the harness. Failures occurred in 40% of the harnesses before this new method was used. Of the first 200 harnesses made with potted plugs, only 1.5% were defective.

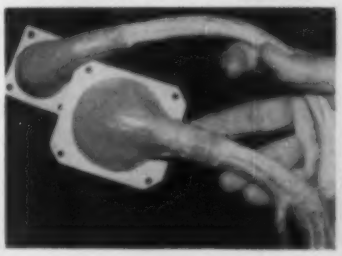
In the first step of the potting operation, varnish and a sleeving material are applied over the connections to prevent dielectric loss through the potting compound. Then disposable plastic molds are fitted over the connections and filled with synthetic rubber.

Butyrate clear plastic is used for the molds because the rubber will not adhere to it. A synthetic thiokol-type rubber is used as potting agent because it flows easily, hardens quickly, and has suitable dielectric properties. Electrical connections covered with this rubber are moisture and fungus-proof and have high resistance to breakage and other damage.

The rubber is injected into the molds with a gun resembling a cross between a grease gun and giant hypodermic syringe. The gun is lined with a special substance to which rubber will not adhere. Rubber-filled molds are cured for 4 hr in a 120F oven. Then the molds are removed.

Employees wear smocks and rubber gloves to protect their clothing and hands from the hard-to-remove rubber.

TERMINALS are enclosed in molds fabricated of a butyrate clear plastic



THIOKOL RUBBER is injected into molds and is cured for 4 hours in 120F oven

Place Shunt Capacitors to Save Line

DISTRIBUTION
Design

Simple formula locates the installations for maximum savings in losses when required for correction of power factor or voltage

L. J. RANKINE
Electrical Engineer, New York, N. Y.

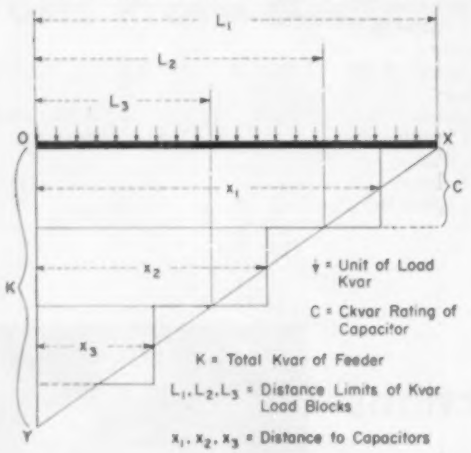
A simple formula can guide selection of the optimum locations for shunt capacitors on distribution feeders. By its use installations required for voltage correction or to relieve the system of reactive load can also produce maximum savings in energy losses.

Determined for load patterns characteristic of those encountered on distribution feeders, the equation gives optimum distance x_n from the substation to one or more capacitor sites. This distance is

$$x_n = 2L_c\left\{1 - \frac{C(n-0.5)}{K}\right\}$$

where L_c = Distance along feeder to center of connected reactive loads

Kvar Distribution Sets Capacitor Location



Example 1: An evenly loaded primary distribution feeder is 3 mi in length and is known to require about 1,000 kvar on peak load. To release feeder capacity and improve voltage, it has been decided to install three 300-ckvar voltage-controlled capacitor banks. What are the approximate locations of these capacitor banks to achieve minimum copper loss on the feeder?

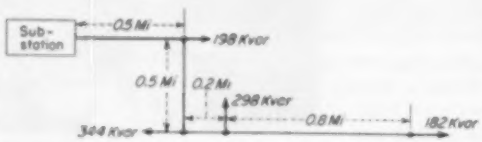
Solution:

$L_c = 3/2$; $C = 300$; $K = 1{,}000$; $n = 1,2,3$

$$x_n = 3\left\{1 - \frac{300(n-0.5)}{1{,}000}\right\}$$

Capacitor location, n	1	2	3
Miles from Substa., x_n	2.55	1.65	0.75

Example 2—Principal reactive loads on a distribution feeder during peak are as shown below. Find approximate locations for three 225 ckva shunt capacitor banks to attain minimum copper loss on the feeder.



Solution:

$$L_c = \frac{(198\times0.5)+(344\times1)+(298\times1.2)+(182\times2)}{198+344+298+182}$$

$= 1.14$ miles

$C = 225$; $K = 1{,}022$; $n = 1,2,3$

$$x_n = 2.28\left\{1 - \frac{225(n-0.5)}{1{,}022}\right\}$$

Capacitor location, n	1	2	3
Miles from Substa., x_n	2.03	1.53	1.03

Example 3: 2 150-ckva capacitor banks are to be installed on feeder totalling 450 kvar. Connected transformers along feeder are as shown. What are locations for maximum reduction in feeder losses?

Transformer kva	Mi. from Substa.	Kva-Miles
15	0.2	3.0
30	0.4	12.0
50	0.9	45.0
30	1.1	33.0
30	1.2	36.0
75	1.5	112.5
15	1.6	24.0
200	1.8	360.0
100	1.9	190.0
50	2.7	135.0
595		950.5

Solution:

$L_c = 950.5/595 = 1.6$; $C = 150$; $K = 450$; $n = 1,2,$

$$x_n = 3.2\left\{1 - \frac{150(n-0.5)}{450}\right\}$$

Capacitor locations, n	1	2
Miles from Substa., x	2.67	1.6

Losses

C = Rating of capacitor bank to be installed, ckva.

n = 1,2,3 . . . n depending on number of capacitors of rating C to be installed.

K = Total kvar input to feeder.

When the distribution of load on the feeder is concentrated toward the outer end, this equation may give an optimum distance exceeding the feeder length. In such cases the capacitor should be placed as near the end as possible.

Three examples demonstrate the application of this equation for typical situations.

Derivation of the formula is best presented by reference to the kvar diagram on the opposite page. Here the solid line O-X represents the feeder with reactive load uniformly distributed as indicated by the vertical arrows. Summation of these kvar gives the total (O-Y) for the feeder, and the reactive flow at any point is indicated by the ordinate from O-X to Y-X.

Optimum correction of the energy losses in the feeder caused by this flow of reactive current would ensue from placing a large number of small capacitors at the points where reactive load is connected. Maximum benefit from a single large bank of capacity C is achieved if it is located at distance x_1 where its ckvar equals double the kvar flowing in the feeder. Geometric relationships of the diagram are such that

$$x_1 = L_1\left(1 - \frac{C}{2K}\right)$$

When this treatment is extended to cover the placement of n capacitor banks each of capacity C, this equation can be applied to each successive installation to provide the step-curve approximation to the circuit kvar distribution shown in the diagram. The equation for each installation takes the form

$$x_n = L_1\left\{1 - \frac{C(n - 0.5)}{K}\right\}$$

This form is correct for a feeder having uniformly distributed kvar load. But substituting for feeder length L_1 twice the distance to the center of kvar load, $2L_c$, converts it to the general form shown first.

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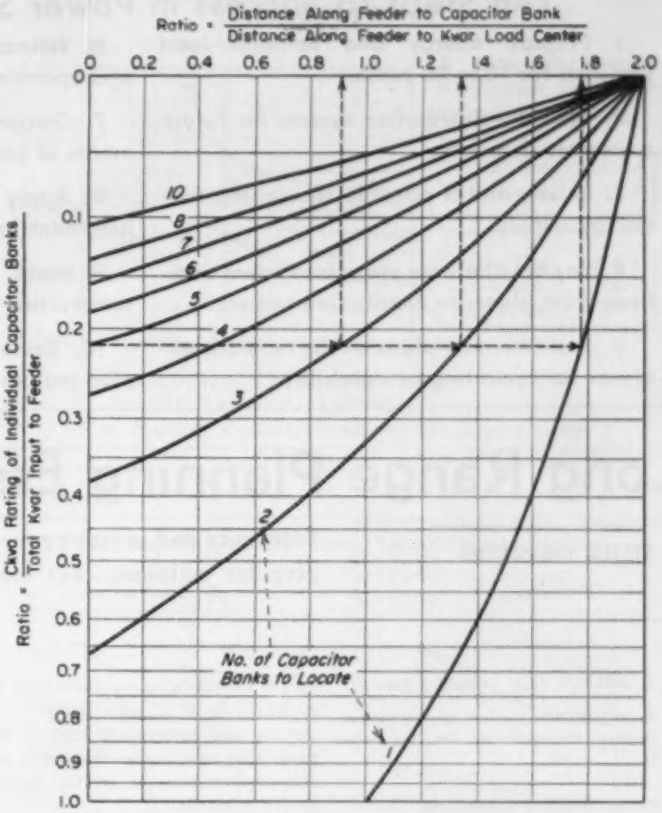

Chart Speeds Determination of Optimum Locations for Capacitors

The simplicity of the formula for optimum location of shunt capacitors on distribution feeders lends itself to graphical solution. Simple resolution of kvar terms into one ratio and distance terms into another permits use of the above chart to determine the best location of any number of capacitor installations.

The case represented is Example 2. In this case it is desired to apply three 225-kvar capacitor banks to a circuit having 1,022 kvar of load. The ratio of bank rating to feeder kvar thus becomes 0.22, represented by the horizontal dashed line. Where this intersects the curve for one bank it indicates a distance ratio of 1.78. Similar readings for the second and third banks are 1.34 and 0.91, respectively. Distance along the feeder from the substation to the kvar load center is computed as 1.14 mi. This figure multiplied by the distance ratios gives the following capacitor locations:

Bank	Miles from Substation
1	2.03
2	1.53
3	1.039

Ten Steps to Success in Power System Planning

1. Prepare energy and demand load forecasts for 10 to 20 years.
2. Plan the distribution system for future customers demands.
3. Select, and if possible secure, the raw energy supply.
4. Lay out alternate plans for system additions from plants to distribution centers.
5. Test alternate plans on the network analyzer for operating acceptability.
6. Estimate investment, fixed charges, and operating costs for preferred plans.
7. Compare the economic and operating merits of plans.
8. Apply experience and managerial judgment in selection of basic program.
9. Make firm decisions covering initial construction projects.
10. Review and extend the long range plan periodically.

Long Range Planning Essential

SYSTEM ENGINEERING
Planning

Economics and operating merits are important factors in planning for additions. But managerial judgment must be used

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P. E. GOURDON, Consulting Mechanical Engineer, Ebasco Services, Inc, New York, N. Y.

An economic and adequate electric power supply system requires a thorough, continual, long-range planning procedure. Such a procedure should include the ten steps listed above. Complete discussion of these ten steps is not possible in an article of this length. However it is possible to present some of the basic considerations and available tools that are helpful in evaluating the economic aspects as they apply to steam stations.

A logical and desirable approach is to develop the site and over-all design from the stand point of an absolute minimum. Each addition, each extension, and each provision for the future can then be tested for sound economic contributions to reliability, labor costs, maintenance costs, etc. Judgment must be exercised in applying the tests. It should be remembered that each dollar invested will carry its burden of fixed charges. When additional investment is made for future requirements, the fixed charges can be a penalty. Broadly speaking, the objective should be to approach each installation as if it were going to be the last and tenaciously hold to this philosophy until sound economics and the requirements of quality service justify otherwise.

One of the most important starting points in considering an absolute minimum plant is the steam cycle. Its selection is strictly an economic consideration. The turbine steam conditions and the specifications of heat-transfer equipment related to the steam cycle all are evaluated on the basis of operational savings. Higher investment cost for improved operation is pitted against estimated net savings. These in turn are a function of fuel cost, income taxes, fixed charge rate, capacity factor, and differential

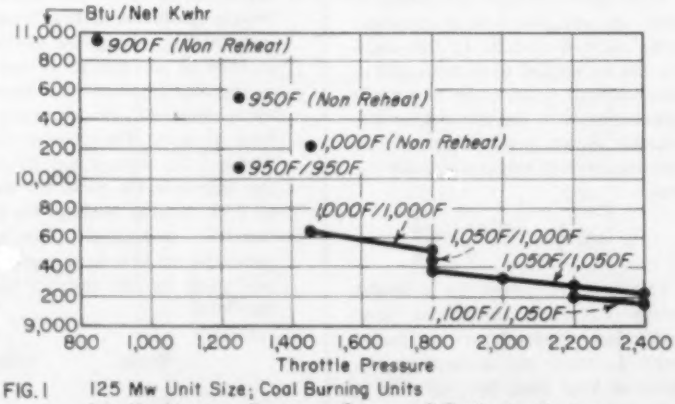


FIG. 1 125 Mw Unit Size; Coal Burning Units
1.5 Hg Absolute Condenser Pressure 5 Feedwater Heaters

STARTING POINT of estimating plant costs is the selection of the steam conditions. This selection of the steam conditions is strictly an economic consideration

Adapted from papers presented at American Power Conference, sponsored by the Illinois Institute of Technology, March 30, 31, and April 1, 1955.

Use of a steam cycle in the supercritical range will give a lower plant heat rate. But resulting improvement in fuel use must be weighed against increased investment required

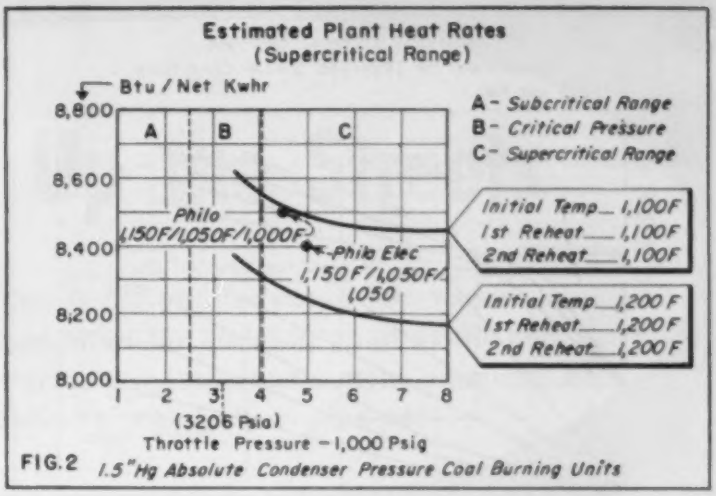


FIG. 2 *1.5" Hg Absolute Condenser Pressure Coal Burning Units*

Experienced judgment is necessary in establishing a capacity factor to estimate cost of a power plant. Difficulty arises because actual loading during plant's life depends on many factors

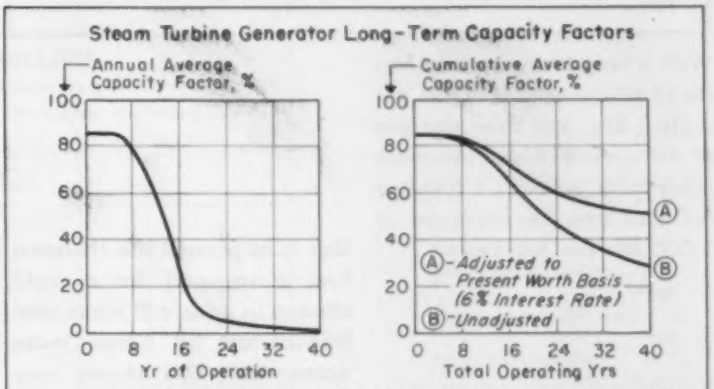


FIG. 3

operating and maintenance costs.

The charts are examples of estimating tools which can be used to assist in the selection of preliminary steam conditions.

Fig 1 is a plot of estimated plant heat rates for a 125-Mw unit employing five feedwater heaters. The accuracy of the absolute values of the plant heat rates is not critical for this type of evaluation. However, the differentials at average operating conditions should be estimated accurately.

If it is felt that in this modern atomic age subcritical pressures are a thing of the past, Fig 2 permits evaluation of heat rate improvements using supercritical pressures. But use of supercritical pressures is also a simple matter of return on added investment. Its advantages must meet the test of sound economics, contributions to reliability, and labor and maintenance costs.

There is no reason to believe that the steam turbine cycle and its binary cycle combinations have been completely exploited in the search for more efficient methods of energy conversion, whether the fuel be fossil or nuclear.

Establishing a capacity factor for these evaluations is an important consideration. Unfortunately it always presents some difficulties. The prospective unit may be heavily loaded during the first few years of its life. Subsequently the capacity factor will decrease as larger, newer, and probably more efficient units are installed in the system. Close scrutiny should be given to the expected loading of the unit during the early years of its life in order to establish a reasonably firm guide as to how far to go in investing for high capacity factor operation if such operation will be realized only for a few years.

The effect of this consideration of capacity factor is illustrated by Fig 3. This graph is an example of capacity factor curves for a hypothetical system. They have been estimated on the basis of a new unit of improved efficiency being installed on the system every two years while system load doubles every ten years. The average curve shows the annual capacity factor that would theoretically be experienced during each year from its in-

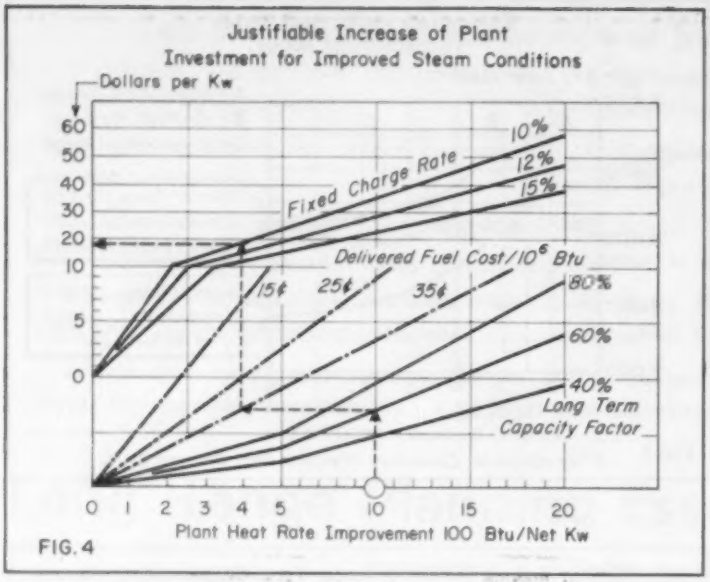


FIG. 4

With a long term capacity factor of 60%, fuel cost of 35¢ per million Btu, and fixed charges at 10%, an $18 per kw more investment would be justified for heat rate improvement of 1,000 Btu per net kw

Gas is at present the cheapest fuel to transport. But a slight change in price will make coal transported by barge more economical. This shows why selection of a fuel cost weighed over the life of the plan is difficult

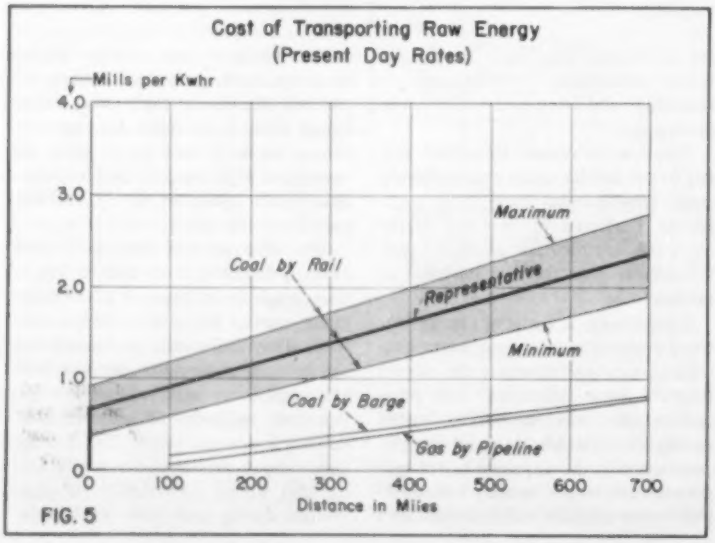


FIG. 5

stallation date for a period of 40 years. Upper limit of the capacity curve was arbitrarily set at 85% to allow for inspection, maintenance, and unscheduled outages. It is not intended to imply that this is a theoretical high limit. The accumulated-average curve was derived from the annual-average and represents the theoretically experienced weighted-average capacity factor up to any chosen year.

Fuel Saving Considered

The same plot shows the effect of adjusting the accumulated-average curve to a present-worth basis assuming a 6% interest rate. Adjusting to a present-worth basis gives added weight to fuel savings derived during the early life of the equipment.

After the capacity factor, fuel cost, fixed charge rate, and plant heat range differential have been established for the set of steam conditions being investigated, Fig 4 permits evaluation of increased investment in dollars per kw for improved steam conditions. This economically justifiable cost is compared with an actual estimated cost difference, taking into account all elements such as the market prices of the turbine, boiler, boiler feed pumps, other mechanical accessories, and auxiliary electrical equipment.

A similar set of tools can be used for evaluating the various heat exchange elements in the steam cycle such as the steam condenser, extraction heaters, etc.

Taxes Important

In the consideration of calculated savings some weight must be given to the question of whether these savings will be actually realized or whether they will be partially offset by payment of taxes. This consideration is perhaps one of the most difficult to evaluate. The magnitude of the comparative savings will undoubtedly influence final judgment. Economic prudence may incline to comprise in favor of the planning requiring lower investment.

In all cases of long range economic evaluations prudent judgment must be applied in the choice of the values and certain cautions must be observed in the interpretation of the results that are obtained.

The important thing to always remember in power system planning is to have a long range plan at all times. It should always be reviewed and extended periodically.

Light Up the Streets

Street lighting is the utilities' "out front" load. It offers rich potential for building good public and community relations. New techniques, more emphasis on promotion are already paying off

Utility Checklist

How hard does your company promote better street lighting? The more "yes" answers, the higher the score

		Yes	Part Way	No
1	Does your company have a well-organized plan for promoting the basic idea of good street lighting?			
2	Does it provide planned 5-year modernization programs for municipalities?			
3	Are reports and surveys on existing and proposed lighting prepared in sufficient detail to induce councils to vote appropriations?			
4	Is promotion aimed at a general plan including residential and arterial rather than entirely at the downtown white way?			
5	Are company engineers willing to accept new designs, new techniques, new light sources?			
6	Do company representatives adhere to Illuminating Engineering Society—American Standards Association code in recommending streetlighting programs?			
7	Is tab kept on areas ripe for modernization so that promotion closely follows need?			
8	Are street lighting rates sufficient to provide a fair return on investment, energy, and service?			
9	Are new installations well publicized through news stories, advertising, and turn-on ceremonies?			
10	Are street lighting courses conducted for municipal officials and other persons instrumental in street lighting modernization?			
11	Are salesmen and engineers kept up to date on street lighting through attendance at national and regional meetings on the subject?			
12	Are communities urged to keep before-and-after records of night accidents and night crimes?			
13	Does your company have an advertising campaign directed toward improved street lighting?			
14	Are installation orders kept up to date so that additional orders may be handled without undue delay?			
15	Is street lighting included in company's area development program?			
16	Do you make use of available movies and other techniques in your promotion?			

Size of the Job:

Only 7.1% of streets lighted to code levels. Here's picture of market and the people who buy. . . . Page 102

Rewards:

Better public relations . . . Page 104

Boosts community pride . . . Page 105

Spurs business activity . . . Page 106

Provides traffic safety, chases crime . . . Page 107

Increases loads, revenues . . . Page 108

Opinion leaders know benefits . . . Page 109

Responsibility:

Good lighting is utility responsibility . . . Page 110

What's Being Done:

St. Louis offers choice . . . Page 111

Promotion pays off for Connecticut L.&P. . . . Page 112

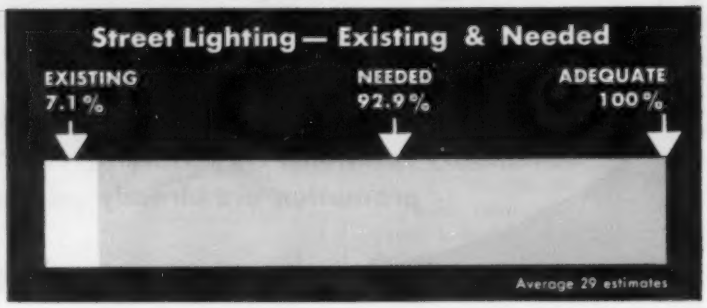
"World's brightest" streets . . . Page 114

Utility lights unincorporated areas . . . Page 115

SIZE OF THE JOB:

The Street Lighting Job Ahead

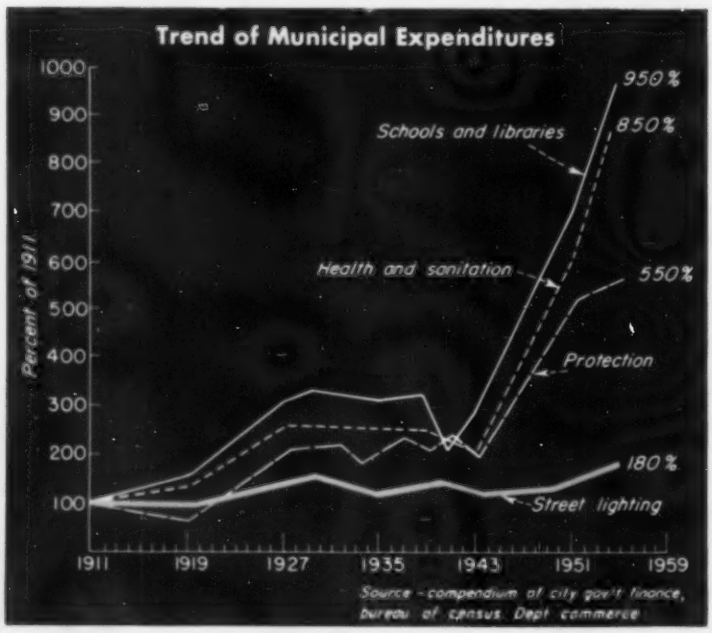
- Utilities play key role in providing adequate lights
- Municipal spending for lighting must be upped
- Street lighting systems must be expanded
- Mayors and political clubs most influential



By the very nature of their existence, electric utilities find themselves squarely in the middle of the street lighting picture. In every city and town they must supply energy for the gleaming lights. In all save a few they are charged with the installation and maintenance of street lighting. And in most places the utility is also cast in the role of promoter and salesman of street lighting.

True, it is the municipal official who must bear the responsibility for furnishing his town with proper lighting. He controls the pursestrings. He has the final say when the issue is raised. But more than likely he calls in utility experts for advice and guidance before making a decision.

The chart above indicates that 92.9% of the street lighting job is still to be done. This estimate, furnished by the National Street and Traffic Safety Lighting Bureau, is an average of 29 estimates submitted by illuminating engineers who have spent their careers in the lighting field. Of the 29, more than a third estimated that present day street lighting is less than 1% adequate when measured by the recommendations of the Illuminating Engineering Society which are approved by the American Standards Association. The code level set by IES-ASA is considered minimum and would provide 1.2 average horizontal footcandles for streets carrying the heaviest vehicular and pedestrian traffic.



Street Lighting Lags

Whether municipal budgets are expanded or trimmed, it is street lighting that gets it in the neck. Street lighting expenditures were among the hardest hit of all municipal expenditures during the depression. Even in the generally expansive postwar years spending for street lighting has lagged woefully behind other services.

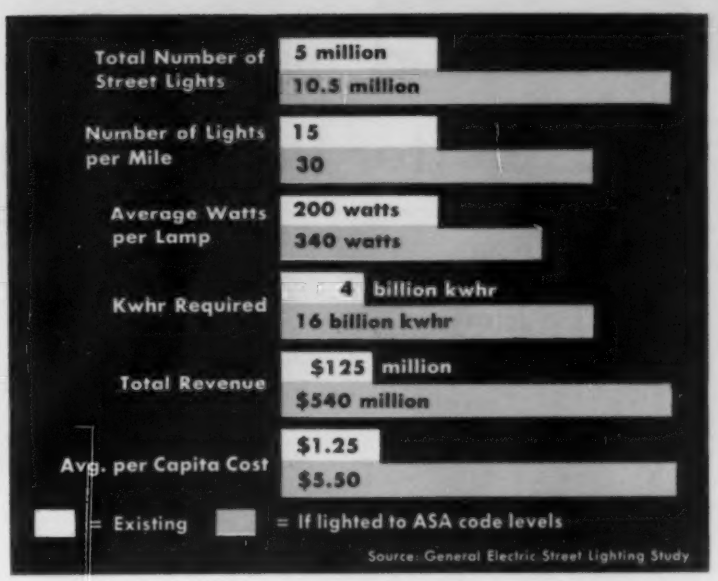
One explanation is that street lighting just can't successfully compete against schools, sewage disposal plants, police, and fire protection for the municipal dollar. Each of these other municipal services has powerful advocates with a stake in their respective fields. Street lighting has fewer advocates in city government willing to stand up and slug it out against competitive odds.

The Needs

For those willing to tackle the job, the challenge is exceeded only by the possible rewards. The size and character of the utility's stake in this street lighting market is indicated by the table at right.

To light adequately the 350,000 miles of residential, arterial and business area streets, some 10.5 million additional luminaires are required. Average lamp wattages must be greatly increased. Per capita cost would rise some four fold.

But the returns would also be great. Utility revenues to be derived from street lighting would rise by 332%. Adequate lighting would also bring many other rewards that can't be measured in terms of dollars and cents.



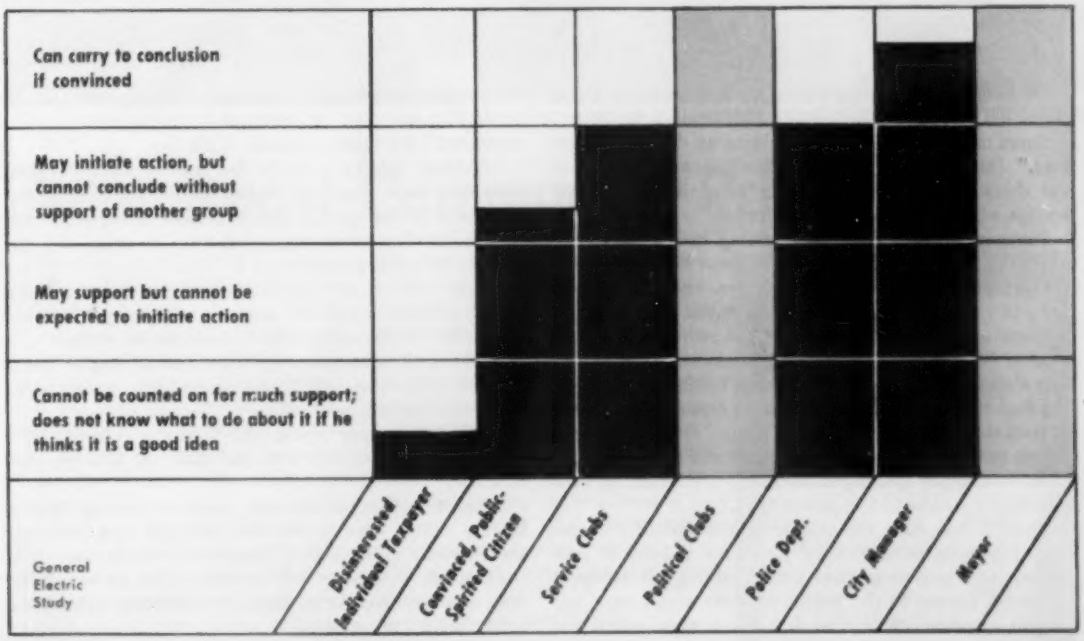
Who Buys?

The successful salesman needs to know two things before he even starts planning a campaign. First, who buys? Second, who influences the buyer? The chart below indicates the relative influence of officials and organizations with regard to street lighting improvement.

Besides those listed below, there are others who can play important roles in forcing decisions on street lighting. Among these are real estate groups, public works commissioners, city engineers and chambers of commerce.

City councilmen or aldermen must be convinced also of the value and reasonableness of street lighting proposals before there is much chance of their acceptance. Especially important is the councilman or alderman who heads the committee overseeing this phase of municipal service.

Thus street lighting promotion must be aimed at a relatively small group of municipal and civic leaders. Ordinary citizens appear content to work through their clubs and organizations or to leave lighting to their elected municipal officials.


Can carry to conclusion if convinced
May initiate action, but cannot conclude without support of another group
May support but cannot be expected to initiate action
Cannot be counted on for much support; does not know what to do about it if he thinks it is a good idea
General Electric Study
Disinterested Individual Taxpayer
Convinced, Public-Spirited Citizen
Service Clubs
Political Clubs
Police Dept.
City Manager
Mayor

THE REWARDS:

Builds Better Public Relations

'Queen Of Light' To Be Selected At June 3 Festival
Modernized City Street Lighting Favored By Hillsdale Residents
New Street Lighting Cuts Night-Time Accidents
Cape to Have 823 Street Lights When Vapor-Type Are Installed
Fourth Street Lighting 'Fiesta' Hailed Success
New Street Lights Go On In Ely
Hillsboro Will Get New Street Lighting System
Henderson to Mark New Street Lighting
Street Lights To Be Turned On Saturday
Complete Installation of Portland Street Lights
Street Light Fete Tuesday for Mayfair
Ellerbe Gets New Lights

STREET LIGHTING PROJECTS ARE ALWAYS GOOD FOR A NEWS STORY AND FAVORABLE PUBLICITY

Some utilities refer to street lighting as their "out front load." Others refer to it as their "calling card." Whatever the characterization, it stands out as a vital community service with a high good-will potential.

Projects for improved street lighting have a knack for capturing public attention. Black streamer headlines across the tops of newspapers in Portland, Ore., and Indianapolis, Ind., in recent months attest to the public interest. Such projects or proposed projects are the subject for a continuous flow of smaller articles in the nation's newspapers (see above). The National Street and Traffic Safety Lighting Bureau in Cleveland has literally bushels of clippings of such stories.

One utility official opines, "A utility can get more space in newspapers by putting in adequate street lighting than by offering a reduction in power rates."

There is one thing common to all this publicity. It reflects favorably on the utility which has a hand in promoting and providing good street lighting. It brings a gratifying answer to the public relations man's most important question, "What do you know good about my company?" Favorable publicity is the key.

Improved lighting provides the positive civic contributions that build good will and good relations among the citizens of a community. This is evident in the pages that follow, for what other single utility service offers as many benefits to a community?

While there is no precise method for measuring the public relations aspects of good street lighting, there are a number of indicators which point to its value.

A Connecticut company (p 112) believes that its labors in promoting street lighting have paved the way to better relations with municipal officials.

An Ohio company reports that favorable publicity on a street lighting program was one asset in securing new financing.

A recent public opinion poll conducted among opinion leaders in one town shows that many of them associate good street lighting with a progressive community. It is perhaps fair to assume they associate good street lighting with a progressive utility, especially where the role of the utility is fully appreciated.

HUNDREDS OF CITIZENS AT TURN-ON CEREMONY—A SIGN OF COMMUNITY PRIDE INSPIRED BY BETTER LIGHTING

Helps Boost Community Pride

Install adequate lighting in a community and you have something the townfolks are sure to brag about. What's more the lighting brings about other improvements in a town. One town did away with all horizontal signs overhanging sidewalks upon installation of a new street lighting system. The old signs went to the backs or the sides of stores in the community revamp.

Utility men and manufacturers see other signs of community pride in new street lighting jobs. Commenting on the recent inauguration of a new street lighting system, one utility engineer said, "Our turn-on ceremonies helped make state history." Political leaders, from mayors to governors, know the pride with which a community looks to new and adequate lighting. You'll find them playing key roles in turn-on ceremonies.

There's a reverse twist on this reward, too. Street lighting salesmen report that one of the easiest ways to sell street lighting improvement is to be able to point to a nearby community with adequate lighting. The pride of good street lighting is contagious.

ANY MORE NOMINATIONS? →

Honor Cities Lighted to ASA Code Levels

1. Highland Park, Mich.
2. Cleveland Heights, Ohio
3. East Cleveland, Ohio
4. Maplewood, Mo.
5. Canajoharie, N. Y.
6. Toronto, Ont.

THE REWARDS:

Business Activity Is Spurred

- **Businessmen, downtown and suburban, report increased buying following installation of new and improved lighting. Stores extend night hours**
- **Milwaukee merchants pay for installation of street lights adjacent to shopping center, then present them to the city**

MODERN STREET LIGHTING makes business districts hum with activity. This night scene in Peoria, Ill., shows the drawing power of good modern street lighting

Merchants have a keen appreciation of the dollars and cents value of good street lighting. Talk with them after an adequate lighting system has been installed, and you'll find the remarks below typical.

Through their associations and clubs, businessmen often become the real driving force behind street lighting campaigns. Their effectiveness is evident in the white ways and bright spots that dot nearly every community. They know adequate lighting attracts customers and helps to protect them against night crime and traffic hazards.

In Milwaukee a group of merchants at a new shopping center banded together, bought and installed street lights on an adjacent street. They already had outdoor lighting for their stores but thought a well-lighted street would bring in more business.

Well lighted streets often lead merchants to improve store lighting. This adds up to a special dividend for load-building campaigns.

Business Leaders Speak Out for Street Lighting

"Not only is our new lighting system safer, but it has helped focus more attention on our stores in town, giving them attractive nighttime appeal. We feel that good street lighting helps bring in more business." **Sid Seligson, store owner, Harrison, N. Y.**

"It sure makes a difference, more people downtown at night and around town over the weekends. Matter-of-fact, I think my business has increased because of it." **Amil Dexheimer, clothier, Fort Atkinson, Wis.**

"The trading area in which we Murfreesboro merchants compete contains several equally accessible shopping centers. Rural customers seem to enjoy shopping in Murfreesboro more since the installation of the new street lights because of the more pleasant environment." **W. T. Haynes, hardware merchant, Murfreesboro, Tenn.**

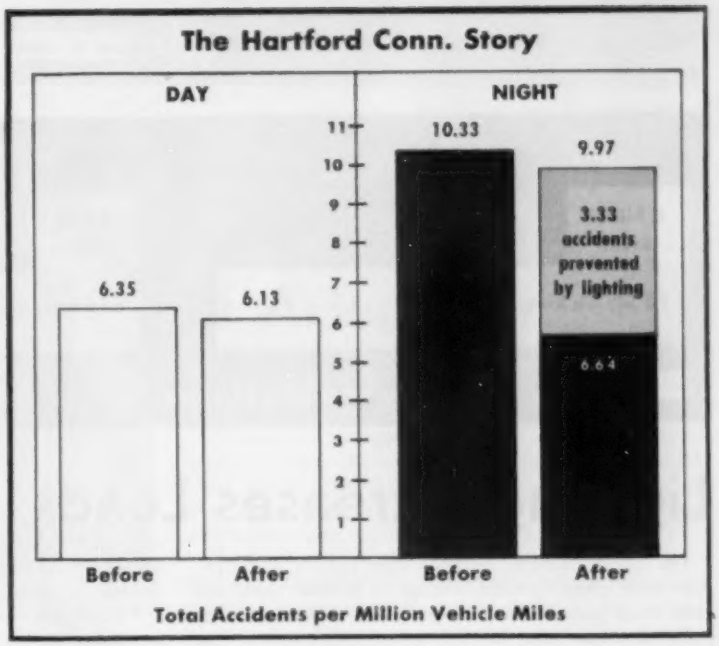
"First of all, there are more women shopping at night. A number of these are career women who cannot shop during the day. Second, the lighting has attracted many new customers to shop in downtown Painesville who formerly shopped elsewhere. Third, the bright expansive lighting causes many people driving through our town to stop; and when they do, most of them make purchases. I think the new lights were one of the finest contributions ever made to help the business section in Painesville." **Ralph Abramson, dress shop owner, Painesville, Ohio.**

Reduces Night Accidents

• Deaths, damage prevented by better lighting

Total costs of all night traffic accidents last year averaged around $35 per car. Annual cost of lighting adequately all urban streets would average around $10 per car. Case histories, including the Hartford study (right), indicate that money spent for lighting would come near being offset by savings in accident prevention.

Studies by the National Street and Traffic Safety Lighting Bureau show that three out of five traffic deaths last year occurred during the hours of darkness. The preventive effects of good street lighting are evident in numerous cases. Indianapolis, Ind., for instance reduced the number of night traffic fatalities from 36 in 1953 to 25 in 1954 while daytime fatalities remained the same. Dayton, Ohio, cut night traffic deaths from an average of 22 per year to 13.



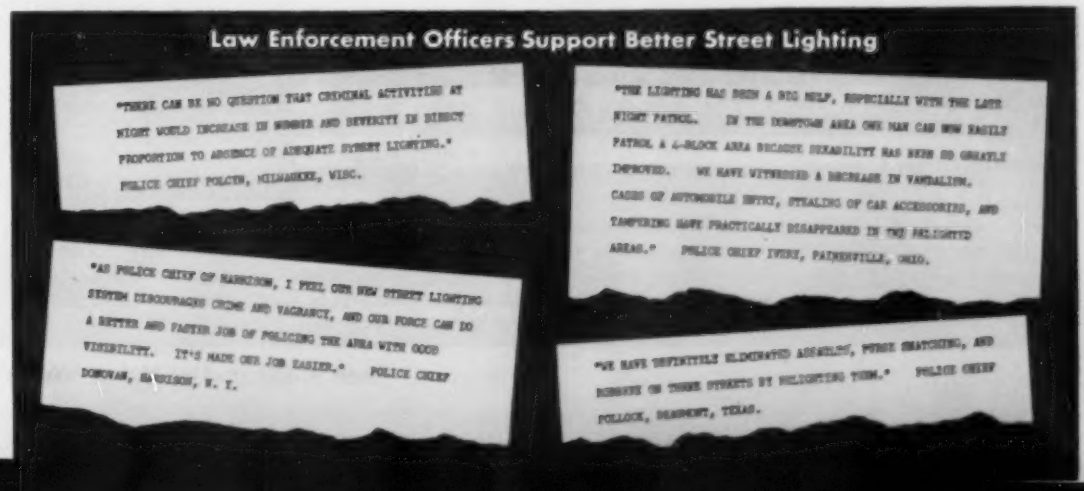
Better Lighting Chases Crime

• Criminals shun well lighted streets

• Enforcement officers praise lighting, say it is worth its cost in preventing violence

There is general recognition that adequate lighting helps deter criminal activity. Householders leave on the porch light to keep burglars away. Women keep to well-lighted streets on shopping trips. The admonition, "stay out of that section of town," often implies the section is ill-lighted.

Statistical studies support the general belief. The National Street and Traffic Safety Lighting Bureau reports that 75% of the murders occur in the dark hours. Other crimes occur at night in the following per-


Law Enforcement Officers Support Better Street Lighting
"THERE CAN BE NO QUESTION THAT CRIMINAL ACTIVITIES AT NIGHT WOULD INCREASE IN NUMBER AND SEVERITY IN DIRECT PROPORTION TO ABSENCE OF ADEQUATE STREET LIGHTING." POLICE CHIEF FOLCH, MILWAUKEE, WISC.
"THE LIGHTING HAS BEEN A BIG HELP, ESPECIALLY WITH THE LATE NIGHT PATROL. IN THE DOWNTOWN AREA ONE MAN CAN NOW EASILY PATROL A 4-BLOCK AREA BECAUSE VISABILITY HAS BEEN SO GREATLY IMPROVED. WE HAVE WITNESSED A DECREASE IN VANDALISM, CASES OF AUTOMOBILE THEFT, STEALING OF CAR ACCESSORIES, AND TAMPERING HAVE PRACTICALLY DISAPPEARED IN THE RELIGHTED AREAS." POLICE CHIEF IVERY, PAINESVILLE, OHIO.
"AS POLICE CHIEF OF HARRISON, I FEEL OUR NEW STREET LIGHTING SYSTEM DISCOURAGES CRIME AND VAGRANCY, AND OUR FORCE CAN DO A BETTER AND FASTER JOB OF POLICING THE AREA WITH GOOD VISIBILITY. IT'S MADE OUR JOB EASIER." POLICE CHIEF DONOVAN, HARRISON, N. Y.
"WE HAVE DEFINITELY ELIMINATED ASSAULT, PURSE SNATCHING, AND ROBBERY ON THOSE STREETS BY RELIGHTING THEM." POLICE CHIEF POLLOCK, BEAUMONT, TEXAS.

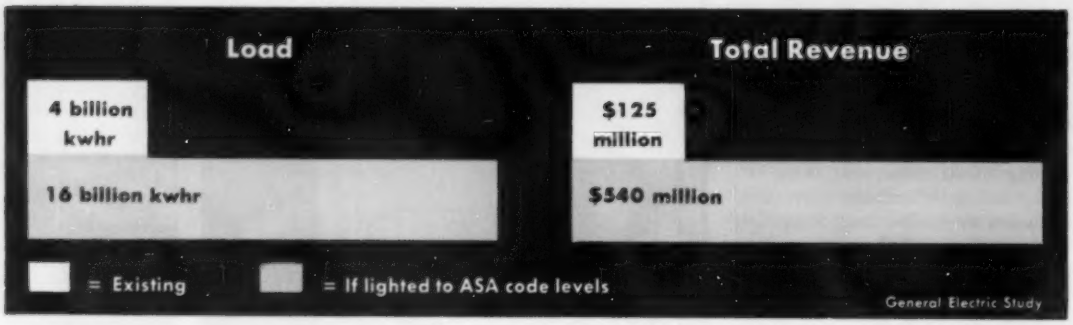
THE REWARDS: *continued*

centages: rape, 76.2%; robbery, 83.35%; aggravated assault, 70.18% and burglary, 81.97%.

The role which adequate street lighting can play in reducing these crimes is well appreciated by law enforcement officers over the nation (see box p 107).

Police officials believe that proper lighting may cut serious crime incidence in half. In Cleveland where one study has been made, it was determined that improved lighting has reduced attacks and assaults on women by 44%, purse snatchings by 30% and robberies by 27%.

Besides chasing criminals, proper street lighting also makes it easier for police to patrol their beats. Several officials report that fewer men are needed on night patrols in well-lighted areas. One police chief from a large southwestern city says, "Savings in police costs alone will materially assist in the cost of adequate street lighting." Good street lighting is good protection.



Lighting Increases Loads, Revenues

The load building potential of street lighting is evident. Add more units, increase wattage in present units, and kwhr usage goes zooming upward. One estimate puts the potential at four times the existing load (chart above). That would come just to bring street lighting up to code levels. It does not take into account the future street and highway additions.

To keep pace revenues would be increased from $125 million to $540 million per year (chart above). Companies with effective promotional programs report large revenue increases in this field. Connecticut Light & Power Co, for instance, estimates its agressive program has brought in $87,500 additional revenue in the first year.

It is common knowledge that street lighting income rarely covers the full cost of providing the service. Some companies, however, report they are making a return on their street lighting service comparable with other types of service. A study recently published indicates that fixed and working capital investment in the street lighting class ranges from 3% to 9% of total investment. The operating income from this class ranges from 2% to 6% of total income (EW, April 4, p84). This is further indication that existing street lighting has generally failed to pay its way.

A Remedy Offered

If this situation is to be remedied, rate structures must be revised so that street lighting pays its own way. Political considerations have long deferred the task of seeking increases, but utilities are now finding ways to make the going easier.

An agressive modernization-expansion program offers one of the best ways to correct outmoded rate schedules. Arguments in its favor are these:

- New light sources, new fixtures offer the opportunity for rate revision.
- Improved lighting, just as improvement in commodities or other services, justifies increased rates.
- Agressive and progressive promotion helps make the public more aware of the value of adequate street lighting, helps utilities get a fairer return on true value rendered.

When Indianapolis Power & Light Co was called in to work out a new lighting system for the downtown streets, a new rate schedule was worked out to cover the lighting costs. This was accepted on an experimental basis with provisions for a review early in 1957.

Rates Can Be Revised

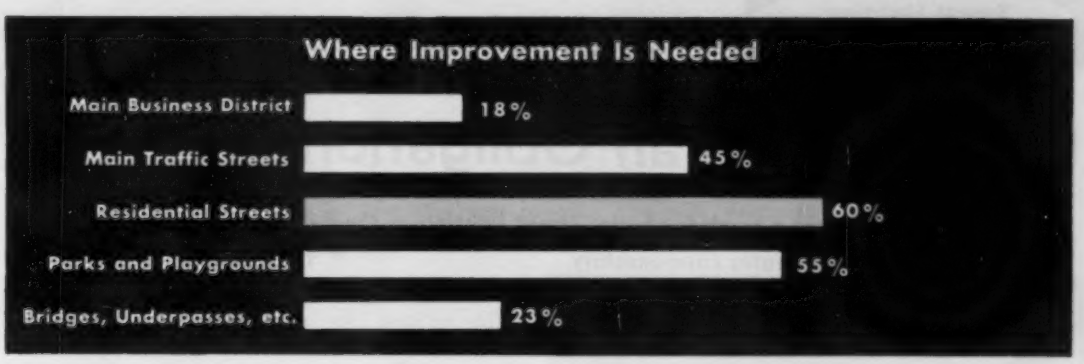
A recent study of the regulatory procedures and attitudes toward street lighting provided these conclusions:

1. Close control of street lighting rates is maintained by utility commissions.

2. Street lighting rate schedules are viewed individually, with general recognition that each utility's position is unique.

3. A utility will get the cooperation of its commission in establishing new rate schedules or contracts justified by shown costs.

There is one other economic consideration to be taken into account. System peaks are tending more and more to come during the daylight hours in summer. Increased street lighting loads can thus be fitted into the pattern to improve load factor.



TURN-ON CEREMONIES *usually draws mayor, other opinion leaders who know and appreciate the value of lighting*

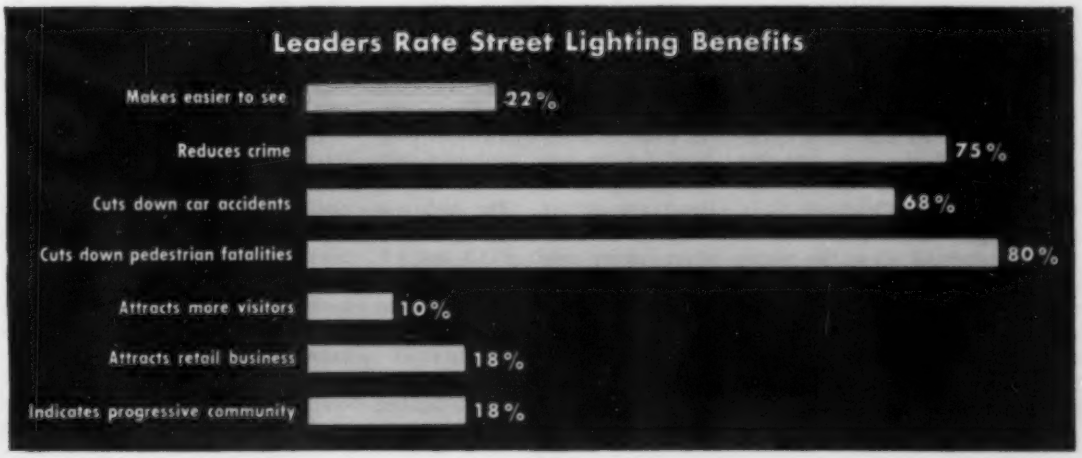
Civic Leaders Know Benefits of Adequate Street Lighting

Opinion leaders—business and civic—have a fair appreciation of where improved street lighting is most needed (chart above), and they know the benefits to be derived from adequate lighting (chart below). However, they are reluctant to strike out on a campaign for it.

These are some of the results of a recent survey conducted in a typical city by a qualified research organization. Some 60 leaders were questioned including the mayor, councilmen, Chamber of Commerce officials, and others.

Their replies indicated that promotion might best be directed at improving lighting in residential areas first. Parks and playgrounds also received a majority vote.

From the survey it was also apparent that financing is the main obstacle to better street lighting. The largest number believed that bonds might be the answer. Next largest group favored taxes for financing improvement.



THE RESPONSIBILITY:

Utilities Have an Obligation . . .

- To carry a torch for better street lighting in their service area
- To make rates compensatory
- To sell hard

HARRY RESTOFSKI, Vice President, Marketing, West Penn Power Co, Pittsburgh, Pa.

Is street lighting treated like a stepchild in your company? Think a bit before you answer mentally in the negative because it's a very common fault. I'm going to ask you three questions to help you reach a correct conclusion.

Do You Carry Torch?

The first question has to do with whether you accept your responsibility to carry a torch for good street lighting. Electric company folks, having much more knowledge of the importance of good street lighting than do most people, have a very real responsibility. It naturally falls to them to tell about street lighting benefits and to do it so persuasively that the communities they serve will have at least reasonably good lighting.

We know, for example, that poor street lighting makes for night accidents—especially fatal accidents—at a rate far above that of the daytime. Good street lighting extends daytime safety to nighttime traffic and brings down the night accident rate close to the level of the day rate. There are plenty of statistics to prove that there is a direct relation between the degree of adequacy of street lighting and the accident rate.

Does street lighting help to reduce after-dark crimes? Competent law enforcement authorities, from J. Edgar Hoover all the way down the line, definitely say yes. Reports from Beaumont, Texas; Cleveland, Ohio; Chattanooga, Tenn.; and Des Moines, Iowa, definitely all tell us that crimes are more numerous on dark streets than they are on streets which are adequately lighted. They add further that in their localities improved lighting has reduced criminal acts by as much as 50% to 60%.

Knowing what we do about street lighting, it strikes me that we have a bounden duty to do something about it; and I don't mean just lip service.

Are Rates Compensatory?

Now let's delve a little further into the matter of treating street lighting as a stepchild by considering rates. One reason why street lighting is not promoted as it should be is that in many companies the rates are not fully compensatory. That's often because street lighting is subsidized as a means of repaying municipal favors or because of reluctance to increase street lighting rates for fear municipalities will resist and perhaps jeopardize badly needed general rate increases.

Either street lighting rates are subsidized by some companies, or we have much wider cost ranges in supplying street lighting service than in other market classifications. Let me illustrate by giving you a summary of rate comparisons I had occasion to have made some time ago and that I believe to be typical of the industry.

A study of rates of 20 companies from all parts of the country and whose rates covered comparable services showed a range on the 2,500-lumen size from a low of $12 per year to a high of $40. On the 6,000-lumen size the low was $18 and the high was $70. The high costs were respectively 3.3 and 3.9 times the low.

To test these wide ranges, we compared for the same companies costs of residential service for the then national average use. The high was only 1.8 times the low as against the street lighting ratios of 3.3 and 3.9.

This comparison supports the conclusion that in making street lighting rates factors other than costs have too great an influence.

It is easy to understand the reluctance to increase street lighting rates for fear that may lead to injecting politics into rate proceedings. However, in most instances it is best to face up to it and treat municipalities like other customers. We had the problem in our company when we filed our first general rate increase several years ago. We used exactly the same basis for changing the street lighting rate as in changing others. We contacted municipal officials to tell them about it just as we did with other sizable customers. The result was that not a single municipality entered a formal protest either on their own behalf as customers or on behalf of their residents.

I believe that fears regarding the effect of a realistic street lighting rate policy are exaggerated. True, if you're in a bad mess now, you'll have no easy time correcting it. One thing you can do to help is to be more realistic in establishing rates for mercury vapor and fluorescent street lighting.

Do You Sell Hard?

And now here's the third test question: Are you aggressively selling street lighting, or do you merely fill orders?

Certainly you are not selling if your attitude can be summed up by saying: "Sure we furnish street lighting. Whenever a municipality asks for an additional light, we give it to them pronto. All they have to do is tell us what size they want and where they want it."

That attitude results from the feeling that there is too much politics in street lighting, too much trouble and grief, and not enough profit. It's the result of bad policies and negative thinking.

Street lighting responds to the same basic sales methods as any other market. Many electric companies know that is so because they have experienced it. The job, reduced to very simple terms, is to tell about street lighting persuasively so that

municipalities will do something about it. When the people are well sold, they become great boosters.

In aggressively promoting good street lighting, we not only sell more, but in addition we improve public relations, and we have the satisfaction of carrying out a responsibility.

In your company is street lighting treated as a respected and full member of the family, or is it treated like a stepchild? If the former, I'm sure you are convinced that is the right policy and that it is fully rewarding. If the latter, then I suggest you reappraise your position. Do that thoroughly and without bias, and I believe that your company, too, will recognize that street lighting is an important member of the family of services performed by electricity—important to your area and to you—important not only because it is a big and growing market, but also because it is a means of building better community relations by carrying out your street lighting responsibility.

ARTERIAL STREETS require higher intensities because of the fast, heavy traffic. They rate attention in promotion

WELL LIGHTED UNDERPASS on the Edsel Ford Expressway near Detroit makes driving easier, helps to reduce accidents

WHAT'S BEING DONE:

St. Louis Offers a Choice

CARTER LEWIS, Commercial Sales Manager, Union Electric Co of Missouri, St. Louis

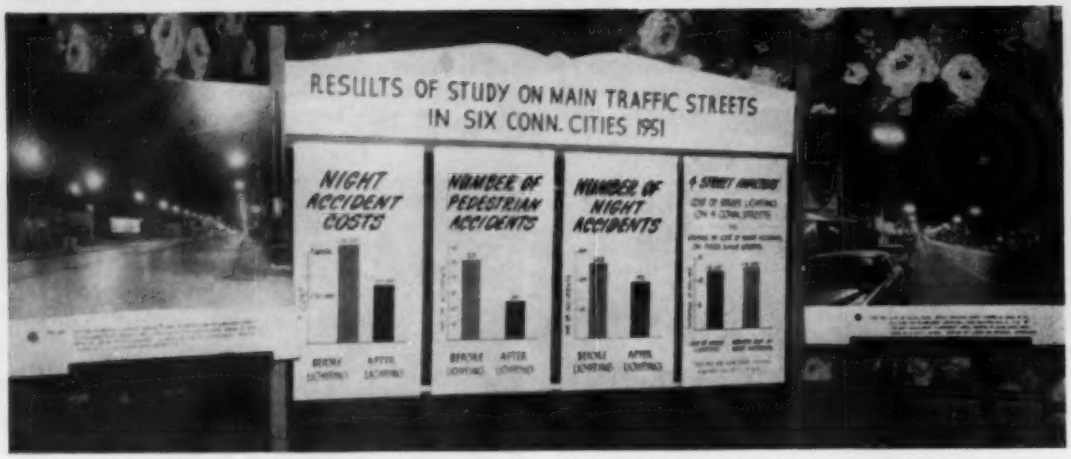
The City of St Louis has made trial installations of three types of modern street lighting sources with a view to using the information gathered in modernization of the city's street lighting. The installation was made on the busy thoroughfare, Olive Blvd.

The trial lighting consists of two blocks each of mercury vapor, fluorescent, and modern incandescent lamps. The new lamps alternate with two blocks of old post top type luminaire, 1928 IES Code, street lighting. There are two blocks of 20,000-lumen mercury vapor lamps, two blocks of old style lighting, two blocks of modern 10,000-lumen incandescent lighting, two blocks of old style lighting, and two blocks of fluorescent lamps.

The 20,000-lumen mercury lamps are mounted on upsweep brackets attached to ornamental hollow spun concrete street lighting standards, approximately 26 ft 9 in. to the light center.

The 10,000-lumen modern incandescent lamps are mounted on upsweep brackets attached to hollow spun concrete street lighting standards approximately 26 ft 9 in. to the light center.

Fluorescent lighting consists of four-100 w lamp luminaires, mounted on existing hollow spun concrete street lighting standards with a mounting height of approximately 23 ft. In the modernization program these would be mounted at proper heights with extensions or on new standards.


RESULTS OF STUDY ON MAIN TRAFFIC STREETS
IN SIX CONN. CITIES 1951
NIGHT ACCIDENT COSTS
NUMBER OF PEDESTRIAN ACCIDENTS
NUMBER OF NIGHT ACCIDENTS

TRAFFIC SAFETY CHARTS AND PICTURES ARE USED AS BACKDROP IN UTILITIES STREET LIGHTING CAMPAIGN

WHAT'S BEING DONE:

Year-Long Educational Program Pays

The Results:

- 2,072 New Units Installed
- 2,492 Units Replaced or Larger Lamps Installed
- 6 Complete Street Lighting Surveys Requested
- 26 Partial Surveys Requested
- 17 Selected Street Surveys Requested

This Means:

- Approximately $87,500 Increase in Annual Revenue
- Broader and Better Appreciation of Street Lighting
- Improved Public Relations For Connecticut L&P

R. E. BALLARD, Street Lighting Engineer, Connecticut Light & Power Co, Berlin, Conn.

Street and highway lighting promotion pays off for everyone— the utility company, municipal government, and tax payers. In just one year, we have experienced an outstanding awakening of interest as a direct result of evening dinner meetings held during 1954 at key points throughout our franchised area. More than 500 municipal officials and community leaders representing over 100 towns accepted the invitation to be our guests, giving us an opportunity to greet them personally and to discuss our mutual street lighting problems.

Basically each program consisted of four parts. A social hour was followed by a full course dinner after which the formal presentation was made. This presentation, the "meat" of the program, consisted of a "flip chart" story of the benefits of good street lighting. As a part of the story the film "Out of Darkness" was shown. Following a main speaker, a question and answer period was conducted by the CL&P manager of the district in which the meeting was held. At each meeting a CL&P manager acted as host and master of ceremonies and also made all arrangements for the meeting.

For this discussion it can be said that towns served by Connecticut Light & Power Co can be placed in either of two categories:

1. Towns having an active interest in street lighting for a period of years.
2. Towns having little or no interest at any time prior to our 1954 promotional effort.

Most of our towns fall into the latter classification, and it was this disinterested group that in a large measure was responsible for the ultimate success of the program.

A typical town in first category is Bristol. Since the end of World War II, particularly, above normal interest in street lighting has been apparent. In fact at the time that a promotional program was discussed for Bristol, it was thought that it probably wouldn't be effective from an increased sales viewpoint but would be effective for improving public relations. As it turned out, both objectives were accomplished.

Within a month after our meeting at Bristol, a follow up call was made on the municipal officials to discuss the meeting and any problems that had arisen since that time. The comments were enthusiastic and since then a marked increase in both size and fre-

TYPICAL CONNECTICUT TOWN BEFORE . . .

. . . AND AFTER RELIGHTING

Off for Connecticut L&P

quency of orders has resulted. For example, a trial installation of ten fluorescent luminaires at a dangerous intersection has resulted in the complete relighting of Bristol's main streets with 64 additional fluorescents. A turning-on ceremony of this main street installation made statewide history. An estimated 35,000 people crowded the line of march for the one and one-half hour parade.

In two and one-half years, Bristol will be "code lighted" in all respects, and the people will reap the benefits of a safer, more progressive community.

Disinterested Group Profitable

This situation is typical of all the communities that fall in this category, and the results are the same — increased sales, safer streets, and increased goodwill for the company.

The more interesting results, however, came from those municipalities that were classified disinterested. The majority were disinterested because of budgetary limitations, a few wanted to retain the antique colonial appearance of their towns, and still others felt that their towns were far enough removed from main highways that increased illumination was not necessary. "After all, if a person can't find his neighbor's house in the dark, he should stay home," was the remark made by one municipal official.

It was from this disinterested group that the majority of our success resulted. Approximately 95% of all town officials in this category came to our meetings. It was at these meetings that our discussion periods were most successful because there was a "why" question for every phase of street lighting from installation to community benefits. Each municipal official had one outstanding characteristic—a deep sense of responsibility to his community. He was vitally interested in anything that would improve existing conditions; and of the community services for which a municipal official is responsible, street lighting exceeds them all in return benefits to the community.

Parallel Promotion Used

The dinner meetings spearheaded our major promotional effort, but coinciding with them, other promotion was carried on. Advertisements on the benefits of street lighting were released by our publicity department for all major newspapers in our territory as well as for the "Connecticut State Journal," a monthly publication sent to all municipal office holders. News stories of outstanding installations were sent to all newspapers, and items of interest appeared in "Connecticut Now And Then," an informative mailing piece accompanying all customers' bills.

When an exceptionally good installation was completed, a release was sent to those trade magazines interested in the promotion of adequate street and highway lighting.

Data Support Larger Budget

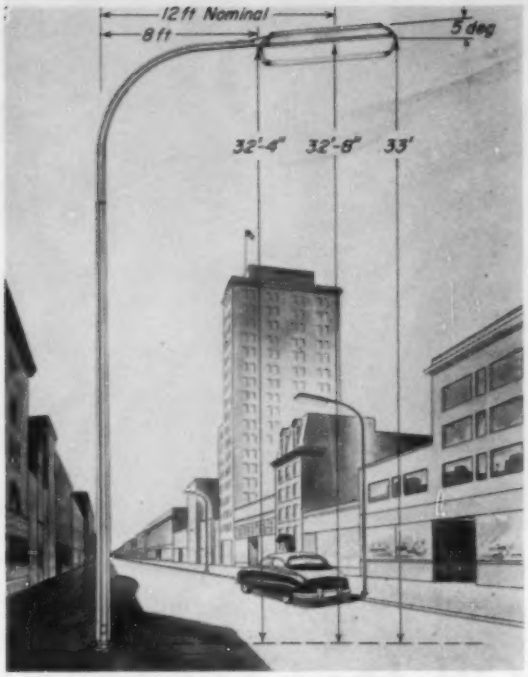
The overall results from our program have been gratifying in every way. Although our public relations have been very satisfactory, the opportunity of talking with community leaders cannot be overlooked; and we feel that better relations were achieved and solidified. In many cases the information gained from the meetings has furnished public officials with additional data to substantiate their request for a larger budgetary allotment for municipal street lighting.

Any utility that hasn't attempted to promote street lighting is overlooking an outstanding opportunity. The resulting increase in sales and improved public relations alone are worthwhile; yet when combined with the many benefits that both the municipal official and the taxpayer receive, it becomes a "must" for everyone.

WHAT'S BEING DONE:

Indianapolis Gets 'World's Brightest' Street Lights

- Output is 64,200 lumens per fixture
- New fixtures installed at old fixture locations and spacing
- Four footcandles produced on street surface
- Accident and crime prevention are objectives



HIGH LUMEN OUTPUT is feature of new street lights. There are 12 fluorescent tubes per fixture, each 72 in. in length

More light with approximately the same number of fixtures and fixture spacing is one of the features of the street lighting system being turned on this month in Indianapolis. The system runs along Washington St, principal downtown business street and a busy part of U. S. Highway 40, and at Monument Circle, the heart of downtown Indianapolis. The new fixtures have an output of 64,200 lumens each to provide what civic leaders proclaim the "world's brightest" street lights.

The 7-ft luminaire holds 12 fluorescent tubes, each 72 in. long. Tubes will operate at 1 amp compared with the 0.43 amp of conventional tubes. Total watts per fixture is 1,470. Each fixture has a plexiglass shield and six 2-lamp ballasts. There will be 118 of the new units installed on Washington St and 28 on Monument Circle and its approaches.

The size and weight (240 lb) of the luminaire require special provisions for supporting it. A 2-in. extension of the steel column of the standard extends into the luminaire 34½ in., almost to the center point. Mounting height is 33 ft to the top end of the luminaire. Mounted with a five degree tilt, the lower end is 32 ft 4 in. above the street.

Calculated average initial light on Washington St is 4.2 ft-c. The street is 80 ft wide, and there is a 20 ft sidewalk on each side. Average spacing of lights is 104 ft, opposite.

For Monument Circle the calculated average initial footcandles is 2.96 to 3.80. The street is 40 to 50 ft wide with 20 and 25-ft sidewalks. Average spacing of lights is 80 ft on one side. Approaches have lights spaced 100 ft, staggered.

A special street lighting rate has been established for this new unit. As there has been no experience with this type of equipment, the new rate was filed as experimental with provisions for a review Jan. 1, 1957. It is agreed that the rate will be increased or decreased on the basis of actual operating experience with the lights.

Total annual cost to the city of the 146 new lights will be $40,150 or $275 per unit. Cost of the old lights was $11,098 per year.

Accidents and crime prevention were the major considerations in the decision of city officials to modernize street lighting, said Richard K. Munter, president of the Board of Public Works.

City officials also wanted to revitalize the downtown area and considered street lighting modernization as essential. The problem was to get a light that would do the job.

The City of Indianapolis worked 18 months with the Indianapolis Power & Light Co, lamp and luminaire manufacturers, and street lighting standard manufacturers to achieve these goals. The new 64,200-lumen units were the result.

The street lighting modernization program has had the support of all civic groups and particularly of the Chamber of Commerce and the Merchants Association.

The new lights are fed at 208 v from the secondary network system in the area. Each 3-phase circuit feeds lights on one side of the street for a distance of two blocks. As the load at each fixture is 1,470w, careful attention was given to balancing the phases.

Original plans were to serve all lights in the same block, on both sides of the street, from the same circuit. This was abandoned because a circuit failure would put out the lights on both sides of the street.

PLANS ARE SHOWN TO COMMUNITY LEADERS IN PORTLAND GE'S CAMPAIGN TO PROMOTE STREET LIGHTING

Unincorporated Areas Lighted

- State legislation permits creation of street lighting districts in Oregon
- Outdoor lighting laboratory, full-blown plans help promote out-of-city pacts
- Standard contract covers all costs on a monthly pay-as-you-go basis

CHESTER W. JARRETT, Consultant, Portland General Electric Co, Portland, Ore.

One of the big problems in our service area was to find some way of providing street lighting for people living outside incorporated cities. An organized group representing these people was needed to support financing and to accept the responsibility for paying energy and maintenance charges of a street lighting system. A bill to allow the formation of street lighting districts was presented and passed the state legislature.

District Has Council Powers

This legislation provides for the appointment of five or more commissioners who have the authoritative powers of a city council. It provides that any group of people with 600 ft or more of street frontage can incorporate for street lighting purposes. A street lighting district meets its financial responsibilities by extending the property tax roll to cover street lighting costs.

Since the law was passed, these districts have become quite numerous. To reduce the number of districts in one area, the law provides for consolidation as soon as district boundaries join each other.

Demonstration Lab Built

Promotion of street lighting requires more than good judgment in design. It is important that good street lighting be seen, understood, and desired by the people of the community. To this end, PGE built an outdoor street lighting laboratory as a part of its promotion. The laboratory, located on several streets in Portland, is designed to compare numerous types of lighting fixtures from the very inadequate to the most modern.

In dealing with lighting district commissioners, city councils, and planning commissions, PGE finds it advisable to avoid some of the technical language associated with street lighting. Instead, such terms as lumens, footcandles, isolux patterns are interpreted in terms of references to the laboratory demonstration and a comparison of costs.

This approach has been proved many times by the intelligent conversation heard at the council table when the formal proposal is presented following the demonstration. At times councilmen point out that more lights should be added than originally indicated. They desire that light patterns join each other in some sections of town considered too remote from either pedestrian or car travel to require a continuous light pattern.

Commissioners Get Map

At these council meetings PGE presents a complete blueprint of the street grid with the street lighting patterns in white, as they will appear in the

WHAT'S BEING DONE: *(continued)*

final installation. A recent innovation is to present county commissioners with a 20-ft folding, plywood-backed map of the proposed lighting of the entire county street and road grid. Each street light is indicated with pinhead-sized drops of phosphorous gum.

Demonstration Is Dramatic

In making the presentation, the demonstration room is lighted with regular fluorescent lighting in which only the county road grid are apparent. By simultaneously switching off the room lights and uncovering a bank of five heavy ultraviolet radiators, the entire county grid suddenly glows with tiny street lights. Mercury vapor lights radiate a blue-green color, and incandescents are yellow-orange. IES standard street lighting patterns are painted in phosphor on the end of the map.

The ultraviolet demonstration follows a previous meeting at the street lighting laboratory. After a discussion of cost data, the commissioners decide to start the project by first taking care of hazardous arterials. Then a mile of demonstration lighting is built to show to county taxpayers.

Success of the street lighting districts has created a new sales tool for the builder and a new utility service, along with water, sewer and streets, for the Federal Housing Administration. Street lighting has given PGE opportunities to further its relationship with FHA. Company engineers often meet with the state director and his associates to discuss problems of serving projects with back-lot-line or front-lot-line electrical construction.

The problem of serving a continuous street in a project with one row of houses on each side of the street, with no future development planned, has been handled on a satisfactory basis. The distribution system is run down the street with the street lights mounted on the wood poles. Otherwise, it would be necessary to build a separate distribution system down the back-lot-line of each row of houses plus ornamental street light poles down the street.

Builders Favor Street Lighting

However, if the project lends itself to back-lot-line construction which will enhance the esthetic value, PGE consents to the FHA request for back-lot-line construction. The Veterans Administration also has been very cooperative in the solution of distribution problems.

Street lighting districts have contributed to an increase in the interest shown by builders. They request lighting systems on the streets fronting their model homes prior to the formation of a street lighting district. Because street lighting helps to sell houses, the company accepts this gamble. Street lights installed at model homes are incorporated in the district if and when it is formed.

Contract Is Standard

Outside the City of Portland, most street lighting contracts are not on a per lamp per year fixed fee basis. Instead, a standard contract is available to cities and street lighting districts. It is composed of five items billed monthly on a pay-as-you-go basis:

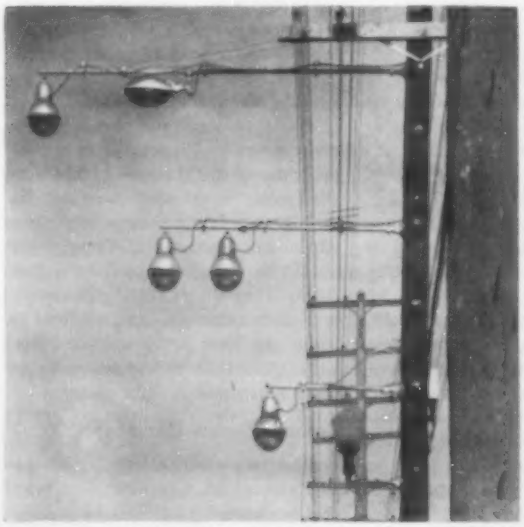
Investment is optional—The district or city pays the original cost of the project or PGE finances the capital costs over a 20-year period.

Energy—One cent per kwhr.

Relamping and washing are optional—PGE will furnish this service and bill materials and labor at cost.

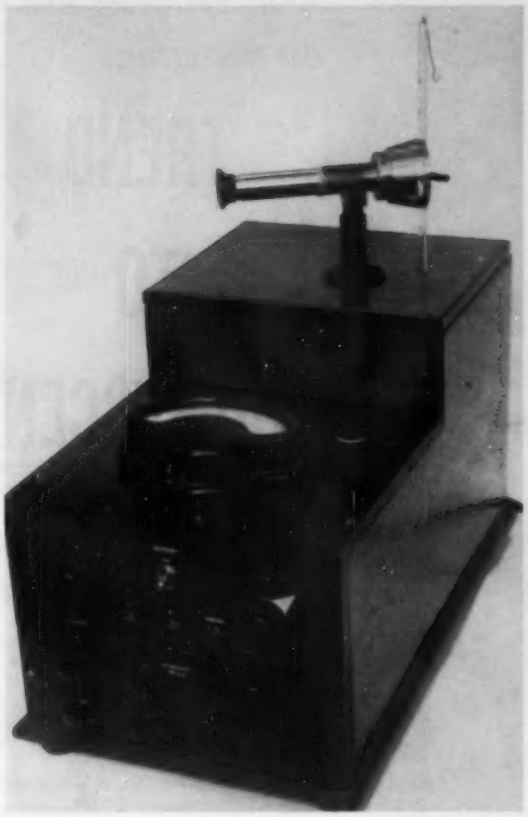
Circuit maintenance—PGE maintains the street lighting circuits and renders a bill covering accrued charges.

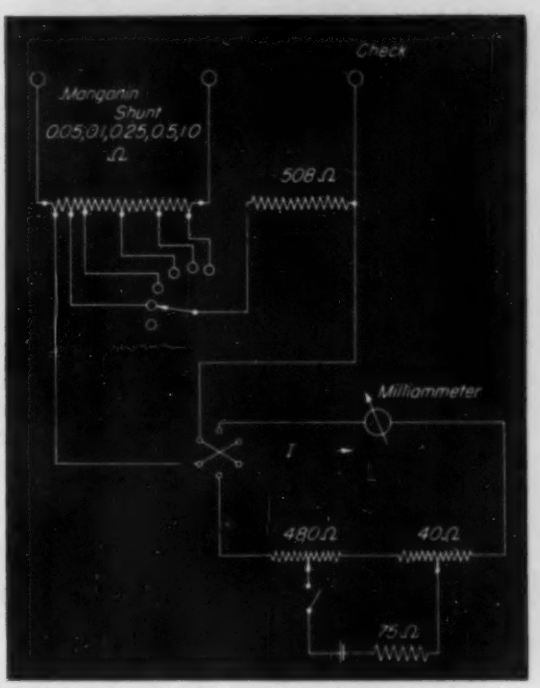
Contact charges—Fifty cents per year is charged for each circuit contact made on company poles. A charge of $1 per year is made for each street light fixture contact on any pole not covered by street lighting investment.



OUTDOOR LIGHTING LABORATORY . . .

. . . SELLS LIGHTS IN NEW HOUSING AREAS





POTENTIOMETER circuit is used to compare emf's of the cell under test with the standard cells in the comparator

APPARATUS combines a precision potentiometer with electrically heated temperature-controlled enclosure for cells

Tests Standard Cell to 0.002% Accuracy

METERING
Design

Comparator devised by the National Bureau of Standards for use in laboratory is inexpensive and easy to use and maintain

A convenient, inexpensive method for maintaining the standard volt in a laboratory with 0.002% accuracy has been devised by the National Bureau of Standards. The method uses apparatus that is simple to operate and requires little maintenance. The equipment consists essentially of four saturated standard cells, a temperature-controlled air-bath for the cells, and a thermofree potentiometer for intercomparing them.

Saturated standard cells (containing an excess of cadmiumsulphate) are employed because they are much more stable than unsaturated cells. However, saturated cells have a negative temperature coefficient of about 50 microvolts per deg C at room temperature so that a constant temperature enclosure is necessary.

To maintain the required constant temperature an air-bath device is used. It is relatively lightweight, inexpensive, and sufficiently rugged for general laboratory use.

The standard cell container of the comparator is made of two cast aluminum boxes, one inside the other. A thermal insulating layer of balsa wood separates the boxes, and another layer surrounds the outer box. Four standard cells are placed in the inner box which, in turn, is surrounded by electrical heating coils. Continuous power to maintain the cells at 34C is supplied from a 60-cps, 120-v line through a stepdown transformer and is controlled by a thermoregulator.

Failure of power (i.e., loss of temperature control) is indicated by a loss in time as shown by a synchronous clock connected to the input of the regulator circuit. A mercury-in-glass thermometer, with its bulb in the outer box, indicates the operating temperature. And the thermometer is read with a low-power microscope.

A built-in potentiometer is used to compare the emf's of the cells. It provides known voltage differences by utilizing the voltage drop produced in a special four-terminal shunt by a measured current. This adjustable current is measured with a 2-ma milliammeter.

The multiple-range shunt consists of an annealed manganin strip to which are silver-soldered long copper

(*Continued on page* 120)

A G-E PROGRESS REPORT

ON THE RISING

TREND TO FLUORESCENT

More Progressive Cities Adopt Newest Street Lighting Source

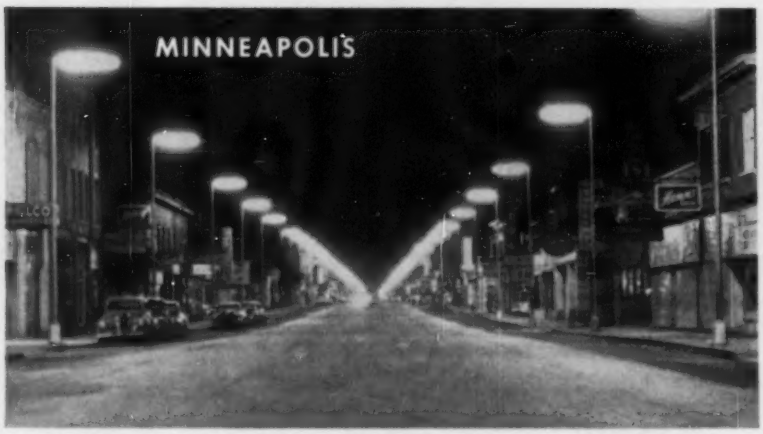
Five years ago General Electric introduced fluorescent street lighting to the United States. Today, thousands of these new luminaires are in service all over the nation. Fluorescent's growth rate is higher than that of any other outdoor lighting source.

What are the reasons for this unusually rapid growth?

IMPROVED VISIBILITY

Doubtless the leading cause of fluorescent's rise to popularity is the great improvement in visibility which it brings about. Some lighting experts say that you see about one third better on a fluorescent-lighted street than on one illuminated to the same level by mercury or filament luminaires. This improvement

NATION'S LARGEST fluorescent street lighting installation is inspected by Minneapolis officials. Flanked by G-E sales manager John Pike and lighting specialist Ernest Wendling, Minneapolis aldermen Frank V. Moulton, George E. Johnson, Jr., and George W. Martens watch installation of Form 206 luminaire.



3.3 MILES of Lake Street now have maintained illumination level of 1.5 foot-candles from G-E fluorescents. 500 of these units have been placed in service in this important business area. Installation is part of city-wide lighting expansion program.

"RECEIVED ONLY FAVORABLE comments on the new lights" says J. W. Monk, Dallas public utilities supervisor. Travis Winter, Dallas P&L, worked with Mr. Monk in obtaining decision to install more than 300 fluorescents in downtown Dallas.

EXCEPTIONAL "SEE-ABILITY" characterizes Lexington Street, Baltimore, under its new General Electric fluorescent street lighting. City and Baltimore Gas and Electric Company are also progressively relighting other areas.

is due to (a) reduced luminaire brightness, (b) improved pavement brightness uniformity and (c) excellent color quality from the "cool white" fluorescent lamp.

PLEASANT, "COOL-WHITE" LIGHT

There's no distortion of colors from the "cool white" light of fluorescent lamps. People's complexions and clothes, familiar objects, etc., look the same under this comfortable light as under sunlight.

MODERN APPEARANCE

The distinctive lines, up-to-date design, and functional beauty of the General Electric Form 206 luminaire make it an asset to any street's appearance.

LOWER MAINTENANCE

The average effective life of a fluorescent street lighting lamp is about two years! The hinged plastic globe enclosing the lamps is shatterproof. Neither the globe nor the light output is unduly affected by sun, rain, heat, cold, dirt, or aging.

LOWER COST

Compared on the basis of judged equivalent visibility with either color-improved mercury or filament, the G-E Form 206 fluorescent luminaire costs less than these other systems! While fluorescent equipment and amortization costs usually are somewhat higher, installation costs are about the same and operating and maintenance costs are generally lower.

MORE INFORMATION?

You can get complete information on the Form 206 fluorescent luminaire from your nearest G-E Apparatus Sales Office, agent, or distributor. Or, write Section 452-161, Outdoor Lighting Dept., General Electric Co., 1400 Western Ave., West Lynn 3, Mass.

Progress Is Our Most Important Product

GENERAL ELECTRIC

"ABSOLUTELY THE BEST" said S. Ivan Sandberg, of San Francisco's Department of Public Works, about the General Electric Form 206 luminaire. Intersection above is near famed Golden Gate Park.

"PAVEMENT GLARE IS REDUCED on Lexington Avenue during rainy or foggy weather" according to Armand D'Angelo, N. Y.'s Deputy Commissioner of Water Supply, Gas and Electricity.

Tests Standard Cell

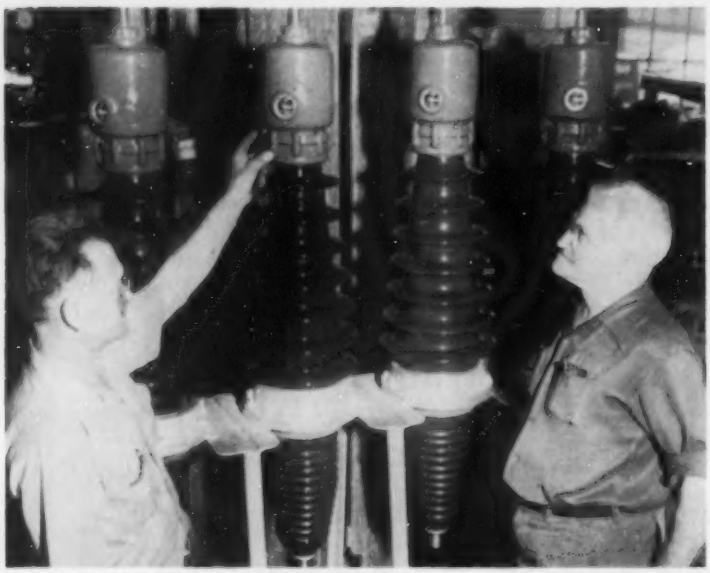
(*Continued from page* 117

leads for potential taps. The resistor is termally shielded by a copper box which surrounds it. Each resistor section is adjusted to better than 0.1% of the desired value.

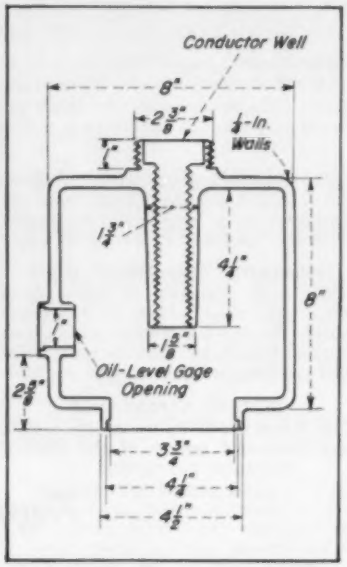
To perform an intercomparison, standard cell of known voltage and the cell of unknown voltage are connected in series, emf's opposing, and the small difference in their potentials is measured with the potentiometer. The negative terminals of the two cells are connected together, and the positive terminal of the unknown cell is connected to one post of the potentiometer. The positive terminal of the known cell is connected through a galvanometer and a switch to a second post of the potentiometer.

When voltages are balanced, the difference in the emf's of the two cells is equal to the product of the milliammeter readings and the resistance value of the shunt for the taps used. A reversing switch indicates by its position which cell has the higher ehmf.

To insure the most reliable accuracy, the standard cell comparator must be maintained continuously at a constant temperature. The thermoregulator used has an inherent sensitivity of ±0.02C. Tests have shown that the temperature of the cells does not vary by more than 0.01C. Thus, changes in emf arising from temperature variations of the cells in the comparator should be less than 0.5 microvolt.



ALL-METAL TOP has magnetic gage with float tank to indicate oil level. With the breather tube eliminated, oil contamination is stopped. Installed cost is $52



BRASS CASTING top for 73-kv bushing is mounted with brass flange adapter

SUBSTATION—Maintenance

All-Metal Tops for 73-Kv Bushings Reduce Maintenance

JOHN FRAKES, Hawthorne Shop, Portland General Electric Co, Portland, Ore.

All-metal tops for transformer bushings, replacing old-style glass units, are economical to make, install, and maintain. The all-metal units cost $52 installed and should increase the overhaul period from five to about 20 years. They also should help reduce vandalism damage at outdoor-type substations. In some areas this type of damage is relatively expensive as well as detrimental to service.

Metal tops now are standard for Portland General Electric's 73-kv bushings. All transformer bushings eventually will be converted to the new top.

The new tops are 8 in. high and 8 in. in diameter, and are brass castings. Installed in a slide opening is a magnetic gage with a float tank that indicates the oil level in the bushing.

The gage replaces the old-style breather tube that allowed bushing oil to become contaminated. With the metal tops, oil will not deteriorate as it did when sunlight filtered through the glass tops. A cast brass flange adapter attaches the new top to the bushing.

The new unit will eliminate the need for cleaning the bushings. This will reduce labor costs because three days' labor was needed to overhaul and clean one bushing plus the time of five men to dismantle, bring in, and replace the bushing.

Only expected maintenance on the new tops, designed by the author, will be replacement of faulty gaskets. Each metal unit has three. However, some gaskets have been in service on the Portland General Electric system for 20 years without indication of failure. This indicates that very little maintenance will be necessary.

SUBSTATION—Operation

Reactor in Feeder Neutral Minimizes Voltage Drop

BENNETT RUTHERFORD, Manager, West Florida Electric Cooperative, Graceville, Fla.

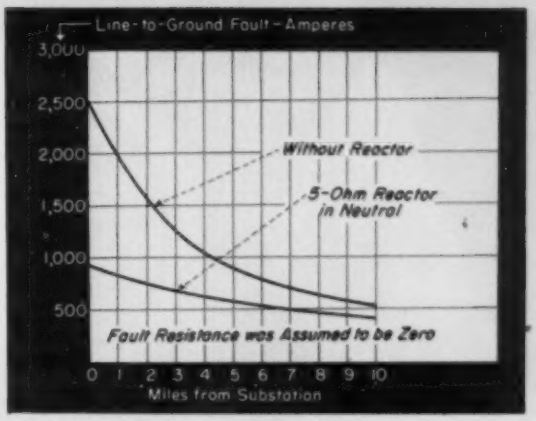
Installation of a reactor to limit the line-to-ground fault current in a 7.2/12.5-kv rural feeder saved West Florida Electric Cooperative the cost of new reclosers. Moreover, by placing the reactor in the neutral at the substation, voltage drop is minimized, and cost of two additional reactors was saved.

The reactor was installed at Graceville Station when the transformer size was increased from 2,000 to 3,750 kva. This change in capacity increased the possible line-to-ground fault currents on single-phase laterals near the station to a value higher than the ratings of the reclosers on the laterals. About 90% of the system faults are line to ground.

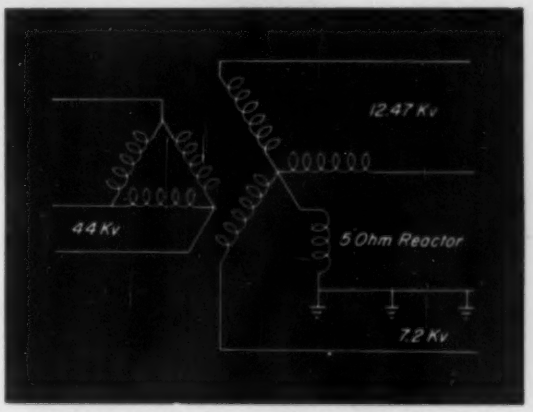
To reduce the fault current so that new reclosers were not required, the co-op calculated that reactors with an impedance of 5 ohms would limit the current to a safe value. Because the load on the transformer bank was almost balanced, it was decided the reactor should be connected in the neutral. This minimizes the voltage drop and also saves the cost of two additional reactors for the 3-phase feeder.

Cost for the 5-ohm reactor installed was less than $800, while installing new reclosers for laterals would have required nearly $3,000.

Accompanying curves for line-to-ground fault currents, with and without the reactor in the circuit, were calculated assuming that the fault resistance was zero. The curves show that greatest benefits from reactors are derived within 5 miles of the substation.



FAULT CURRENTS for line-to-ground faults are lowered appreciable on laterals near the substation by the reactor



REACTOR installed in the neutral of rural feeder saved replacement of reclosers on the laterals near the substation

METERING—Testing

Rugged Field Tester Checks Demand-Meter Registers

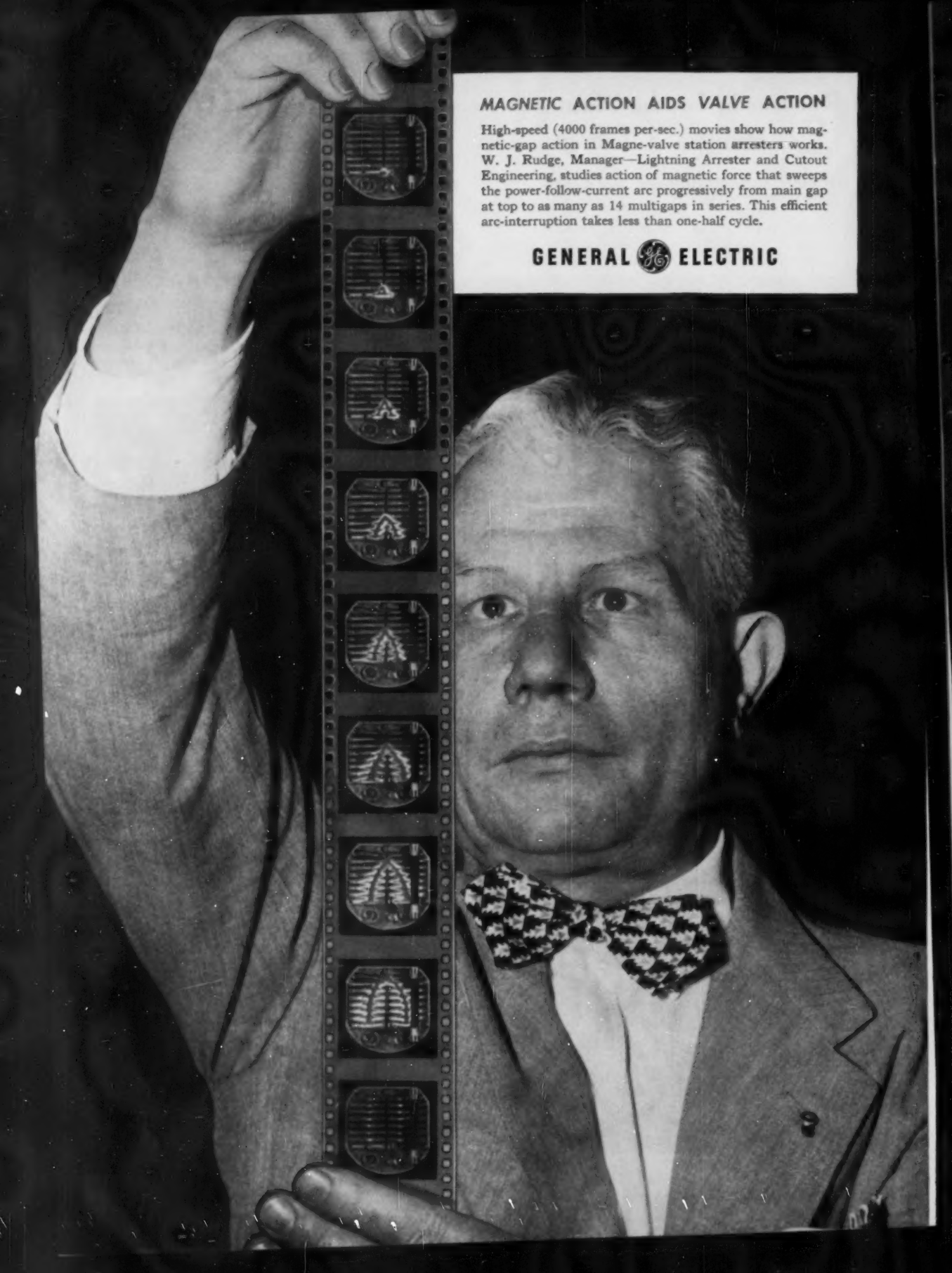
M. D. JESTER, Central Power & Light Co, Corpus Christi, Texas

Rugged equipment for field testing indicating demand registers and recording demand meters has been designed and built in the Central Power & Light Co's Corpus Christi meter shop. This device was designed to stand the rugged abuse of traveling with a minimum of maintenance.

The testing unit is housed in an oak case 14½ in. long, 10½ in. high and 7¾ in. deep and is equipped with a carrying strap. The case opens from the top. The front is made of plasti-glass and is hinged so that it may be

(*Continued on page* 130)

PORTABLE TESTER was designed to withstand rugged abuse of continuous traveling. Case is closed during tests

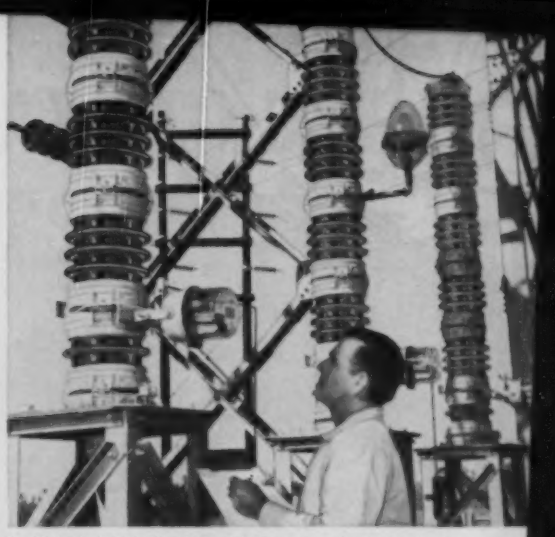


MAGNETIC ACTION AIDS *VALVE* ACTION

High-speed (4000 frames per-sec.) movies show how magnetic-gap action in Magne-valve station arresters works. W. J. Rudge, Manager—Lightning Arrester and Cutout Engineering, studies action of magnetic force that sweeps the power-follow-current arc progressively from main gap at top to as many as 14 multigaps in series. This efficient arc-interruption takes less than one-half cycle.

GENERAL ELECTRIC

NEW G-E LINE ARRESTERS have far higher reliability because of Thyrite Magne-valve design. Seven new ratings extend line from 3–121 KV.



NEW G-E STATION ARRESTERS have discharged lightning currents of 20,000 amperes with up to 30 operations per year recorded in actual service.

NEW G-E station and line arresters with exclusive "Magne-valve" action give 20% greater lightning protection

That high-speed movie film strip at the left shows the most significant forward step in lightning arresters in the past 25 years. You're looking at the magnetic-gap action of General Electric's "Magne-valve" principle—a combination of *magnetic* action of series gaps and *valve* action of improved Thyrite® disks.

HERE'S WHAT IT MEANS TO YOU: MAXIMUM LIGHTNING PROTECTION.

On both station and line arresters, you get as much as 20% more protection. With "Magne-valve" station arresters you get *protection* for one-step reduced insulation equal to that previously given to full insulation; better *protection* to rotating machines and dry-type transformers. You get three times greater discharge capacity to withstand multiple strokes, severe switching surges, and long-duration discharges.

LINE OR STATION— WHICH SHOULD YOU CHOOSE?

G.E's new "Magne-valve" principle has resulted in improved performance for both. Although there isn't any simple formula that can be applied everywhere, G-E station arresters are generally preferred for locations where size and importance of apparatus demand the best in protection for uninterrupted service continuity.

But the final selection depends on your particular application—the economics and engineering involved in each specific location.

To help you select the right type of Magne-valve arrester, call in an Application Engineer from your local G-E sales office. Bulletins GEA-1304 (New Station Arrester) and GEA-2978 (New Line Arrester) are available for the asking. Write to General Electric Company, Schenectady 5, New York. 432-13

®Reg. Trade-mark of General Electric Co.

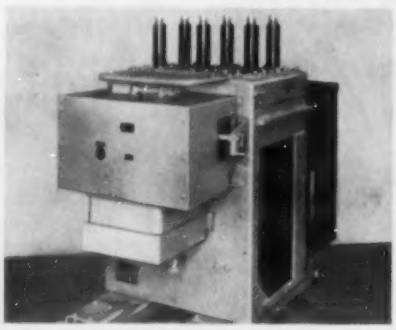
Progress Is Our Most Important Product

GENERAL ELECTRIC

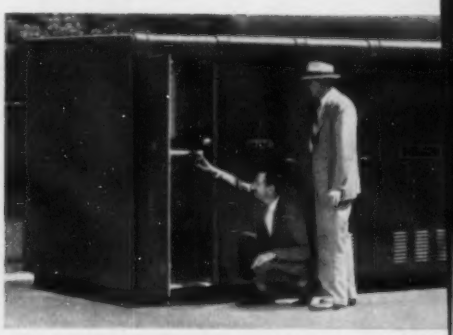
Add it all up . . .

CLEAN COMPACT G-E UNIT SUBSTATIONS . . . metal-clad switchgear connected to 3-phase transformer by streamlined transition compartment . . . presents attractive appearance, requires little installation space.

METAL-CLAD SWITCHGEAR with advanced-design weatherproof construction. All-welded steel frame stands cross-country shipping jolts. Factory pre-assembly simplifies installation.

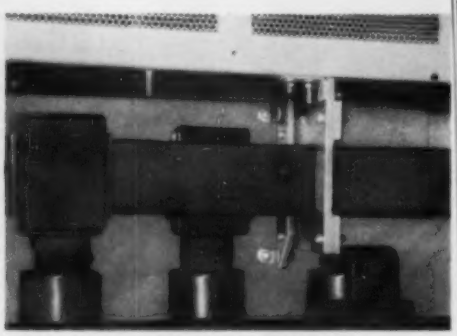


MAGNE-BLAST BREAKERS have 5-cycle clearing time, highly-repetitive-duty performance, close and latch against full momentary rating, built-in "capacitor-switching" ability.



SWITCHGEAR MAINTENANCE is fast and easy. Magne-blast breakers require ⅓ as much maintenance as similar oil breakers. All components are easily accessible.

SELF-X FLAME RETARDANT INSULATION, backed by four years of field experience, provides greater protection at all vital points in breakers and switchgear compartment.



TOTALLY ENCLOSED INSULATED BUS is practically impregnable. Since it is not exposed at any point, it requires almost no maintenance, provides greater reliability.

. . . HERE'S WHY IT PAYS TO BUY A G-E UNIT SUBSTATION

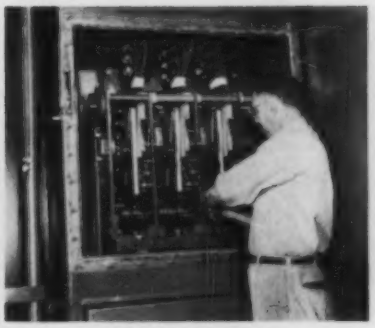
The high-quality features built into General Electric Unit Substations add up to important long-range savings. These reliable, compact units are faster to install, require less space, are easier to maintain and help you provide more reliable service for your customers.

Some of the cost-saving features of this equipment are illustrated on these pages. For the complete story, contact your G-E Apparatus Sales Office, or write for bulletin GEA-3800. Section 512-6, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

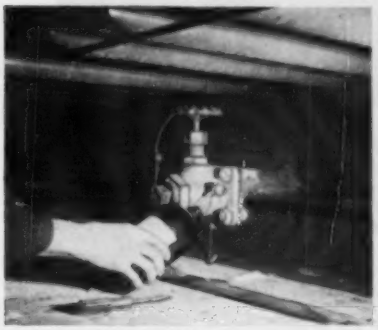
GENERAL ELECTRIC

COMPACT 3-PHASE TRANSFORMER has only ⅓ as many bushings as three single-phase transformers, requires less maintenance. *American Standard Bushings* reduce inventories.

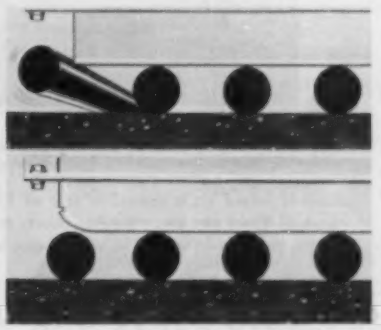


LOAD TAP CHANGING EQUIPMENT provides voltage regulation. Large hinged door, providing easy access to operating mechanism, simplifies maintenance.

FORMEX® WIRE WINDINGS reduce size and weight, increase reliability. This tough, pliable film insulation, which is an integral part of the wire, has amazing dielectric strength.



FLOOR-LEVEL DRAIN allows more complete filtration. In addition, it permits sampling of poorest oil to give better check on conditions inside the tank.



SKI-TIP BASE for easier transformer installation. Ordinary base (top) has sharp corners, is difficult to skid. Ski-tip (bottom) rolls smoothly and simplifies installation.

AND YOU GET THESE "EXTRAS" WHEN YOU SPECIFY GENERAL ELECTRIC

- **One year warranty on *entire equipment.***
- **Installation inspection service.**
- **"Match-and-line-up" service that provides additional matching feeders long after original installation.**
- **Good appearance that promotes community goodwill.**

®Reg. trademark of General Electric Co.

Two Simple Tests Check Economics of Shunt Capacitors for Loss Reduction

DISTRIBUTION
Design

- Justification of capacitors for reduction of losses
- Calculation of optimum correction of power factor

L. J. RANKINE, Electrical Engineer, New York, New York

Two simple calculations determine quickly how many kvar of shunt capacitors can be justified economically by reduction of system losses alone. The first discloses whether capacitors can be justified; the second determines how much capacity to use.

I—Application of shunt capacitors to reduce system power losses can be justified provided:

$$\sin 2\phi > R/L$$

where

$\cos \phi$ = system power factor before correction.
R = installed cost per ckvar of capacitors expressed as percent of total system cost per kw.
L = circuit (or system) power losses expressed as percent of circuit (or system) kw load.

II—Optimum correction of power factor on systems which satisfy the first requirement is to a new power factor angle t. This value is determined by the equation

$$\tan t = \frac{R}{2L \cos^2 \phi}$$

A simple chart speeds this calculation. It is based on the "tan t" equation.

Example for Use of Chart

A primary feeder in a fully loaded system delivers 2,000 kw at 80% pf with 100 kw copper loss. If total system capacity is valued at $264 per kw, how many ckvar of shunt capacitors are justified. What will the corrected power factor be?

Installed cost of $7 per ckvar is 2.65% of the $264/kw system cost. And circuit losses are 5.0% of circuit kw. The ratio, R/L, thus becomes 2.65/5.0 = 0.53.

Angle ϕ for 80% pf is 36.8 deg; sin 2ϕ then becomes 0.96. Because this value exceeds that for R/L, shunt capacitors can be justified for reduction of losses.

Entering the chart at 5.0% loss ratio and extending to intersect 0.80 pf indicates 0.924 as the optimum corrected value.

The ckvar required is computed as:

$$\begin{aligned} \text{ckvar} &= \text{Kw}(\tan \phi - \tan t) \\ &= 2{,}000(0.750 - 0.415) \\ &= 670 \end{aligned}$$

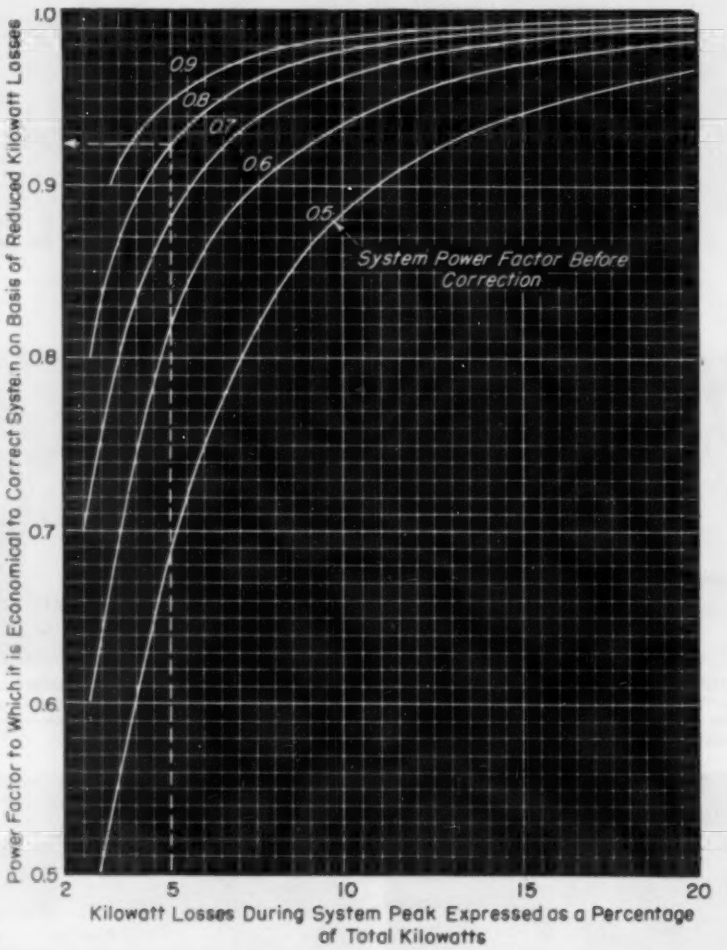


Chart is based on a capacitor cost of $7 per installed ckvar and a total system value of $264 per kw. Similar charts may be prepared to cover different dollar values, provided the dollar values can be assumed to remain constant

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FOR CONDENSER AND HEAT EXCHANGER TUBES AND PLATES SPECIFY

Revere

CUPRO-NICKEL—30%, 10%
ADMIRALTY METAL
ARSENICAL COPPER
ALUMINUM BRONZE—5%
MUNTZ METAL
REVALON (ALUMINUM BRASS)

• Correct selection is essential if tubes and plates are to serve with the maximum economy and minimum trouble. The Revere Technical Advisory Service and Revere Research Department are always ready to collaborate with equipment manufacturers and operators in specification matters. • When it is time to re-tube, remember that conditions may have changed since the original installation, and that it may be wise to re-check before ordering new tubes. • To take advantage of Revere's knowledge of copper and copper alloy tubes for all industrial purposes, get in touch with the nearest Sales Office. See your telephone book or write direct. Send for helpful booklet, "Life Extension for Condenser Tubes." Free.

REVERE

COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
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• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

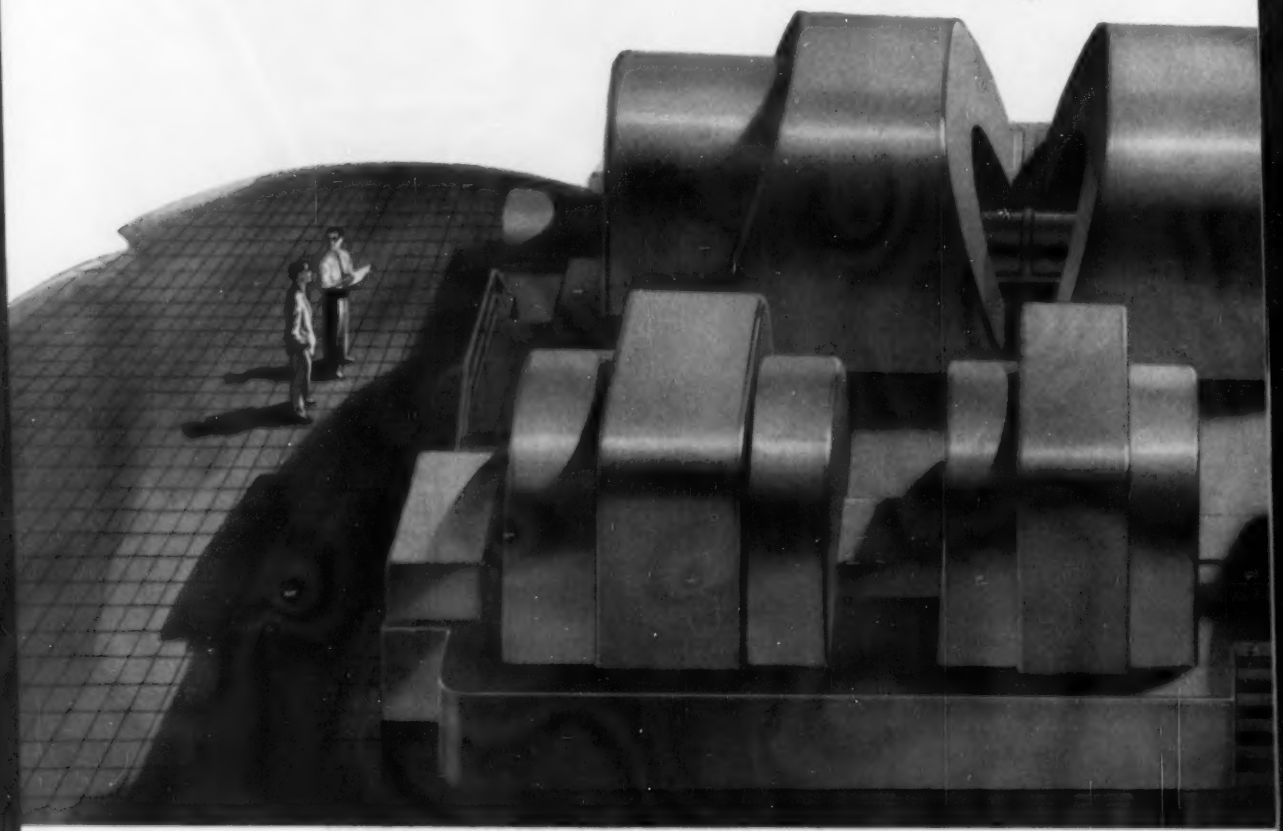
300,000-Kw Steam Turbine Generator

New In Power

The illustration below shows a model of a 300,000-kw steam turbine generating unit being built by Allis-Chalmers for Detroit Edison. Its capacity is far higher than that of any steam turbine generating unit yet built. It is capable of supplying the needs of a city of half a million people.

When this new unit goes into operation, the total capacity of the Detroit Edison system will be more than 3¼ million kilowatts — double the system's capacity of ten years ago.

Many features of this unit are examples of Allis-Chalmers developments that help utilities keep pace with our expanding economy. The unit is close-coupled, cross-compound reheat design, with two generators, one on the 3600-rpm shaft, one on the 1800-rpm shaft. The 3600-rpm generator is fully supercharged, taking advantage of an



A-C ALLIS-CHALMERS

ALLIS-

Paces Utility Progress

Era Generation

Allis-Chalmers development that makes possible higher capacities and smaller relative sizes.

The fully supercharged 3600-rpm generator is rated 206,470 kva, 0.85 power factor, 0.80 short circuit ratio, at rated hydrogen pressure. The 1800-rpm generator is a conventional hydrogen-cooled machine that is rated 171,765 kva, 0.85 power factor, 0.80 short circuit ratio, at rated hydrogen pressure. Operating steam conditions are 2400 psig, 1050 F at inlet; 1000 F reheat; and 1 inch Hg absolute exhaust pressure.

* * *

If you would like more information on Allis-Chalmers steam turbine generating unit developments, your nearby Allis-Chalmers office will be glad to arrange a discussion at your convenience. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-4794

CHALMERS

Rugged Field Tester Checks

(*Continued from page* 121)

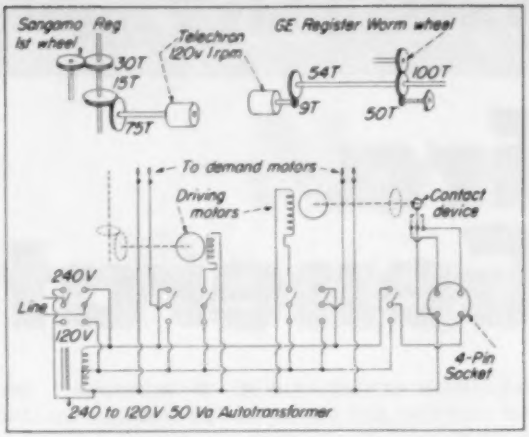
opened and laid down to the front. During the test period, the case is closed to prevent sand and dirt from being blown into the register under test. The register may be observed during the test period through the plasti-glass front.

The chassis for the testing unit is made of 14-gauge steel to assure proper alignment of register supports and shaft bearings so that proper mesh is provided between the register worm wheel and the driving gear. The chassis is held in place in the wood case by four wood screws. The test unit is designed for testing the two types of registers which are predominantly used and may be easily converted to test other types of registers.

Telechron motors furnish power to the driving shaft. The shaft drives the register at a rate equal to the disc constant of the register. At the end of the test period the indicated demand is the same as the disc constant of the register.

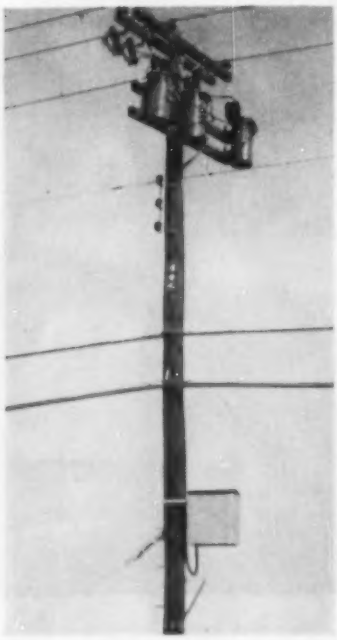
The equipment includes a small autotransformer which permits the operation from either a 120 or 240-v source. By flipping toggle switches the indicating demand registers equipped with 120 or 240-v motors may be tested.

An overrunning clutch on the motor shaft drives the main driving shaft. This permits the main driving shaft to be rotated manually two and one-half revolutions driving the demand pointer up scale an amount equal to the disc constant of the register, which is the low test point. Five revolutions establish the high test point. This provides a quick check of the register for clutch slipping, proper setting of the zero point, or any other defects that may appear in the register during the test period.



AUTOTRANSFORMER and double-throw switch make it possible to use test unit with either 120 or 240-v supply

A set of contacts on the main driving shaft will operate a recording demand meter. A four-prong tube socket on the front of the chassis and a four-prong plug with a suitable length of No. 18 four-conductor, rubber cord, with pin terminals, connects the demand recorder to the tube socket for the demand recorder test. The speed at which the contacts are driven drives the recorder stylus up to a reading of 50 on the demand chart. An overrunning clutch feature permits the tester to check the recorder manually before commencing a time check.



TEST BANKS provide primary voltage at strategic points on Dallas system

DISTRIBUTION—Operation

Voltage Test Banks Improve Distribution

Voltage check points are provided on the Dallas Power & Light Co distribution system by installing banks of small transformers at carefully selected locations. These banks do not supply any load so that voltage on the secondary side indicates primary voltage correctly. Check banks are installed near substations and feeder load centers.

Voltage charts are made continuously at the test banks near substations. In this way faulty operation of substation bus regulators is immediately detected. Also, gradual increase or decerase in voltage due to seasonal variations in load is observed. Bus voltage may be raised or lowered, as necessary, by:

1. Changing compensator settings on regulators or voltage level adjustment on regulating transformers.

2. Changing substation transformer taps.

3. Connecting or disconnecting substation capacitors.

4. Changing transmission voltage level.

Adjustment of regulator compensator settings is the method most often used, unless regulators are already reaching their limit of travel in the direction of the desired change. In that event, changing substation transformer primary taps will generally bring about the desired correction.

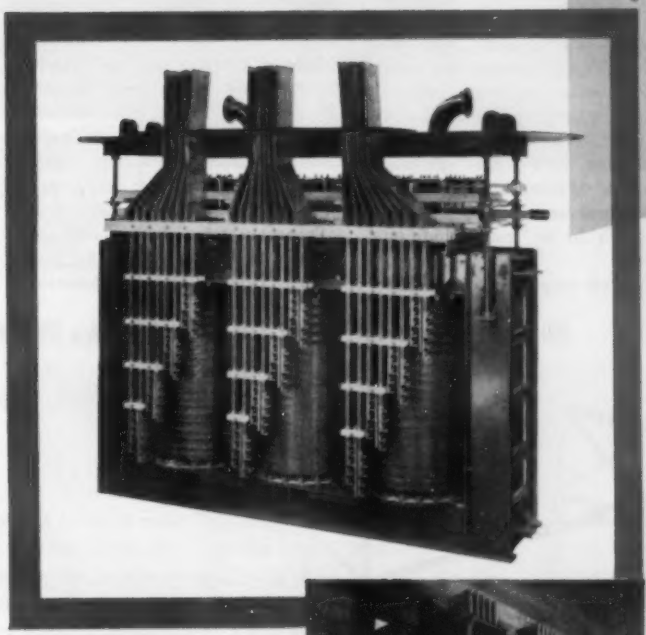
Substation capacitors are generally switched according to system power factor requirements. However, the nomal schedule may be varied temporarily in some cases for voltage correction.

The transmisson voltage is maintained at a value that results in the best over-all system voltage conditions. It cannot feasibly be raised or lowered to correct improper voltage

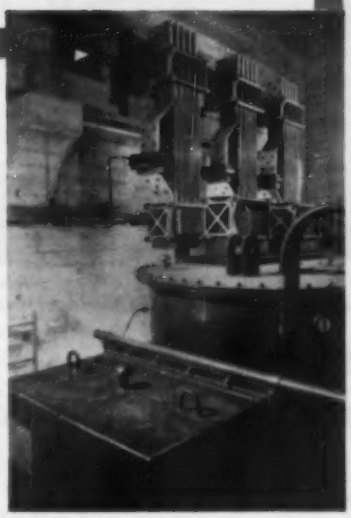
(*Continued on page* 132)

A Furnace Transformer Record by PENNSYLVANIA ....

No Low Voltage Breakdowns in 20 years



Low voltage side of a 25,000 Kva Pennsylvania Furnace Transformer. Three phase, 60 cycles, water-cooled. High voltage: 13,800 volts. Low voltage: 430 to 290 volts. Maximum line current 39,000 amps.



18,750 Kva Pennsylvania furnace transformer in service at a West Coast steel plant. Three phase, 60 cycles, forced-oil/water-cooled. High Voltage: 6600 volts. Low Voltage: 375 to 144 volts. Maximum line current: 33,300 amps.

In 1936 Pennsylvania introduced a new type of helical winding in the low voltage coils of a 2500-kva furnace transformer. Since then, the same principles of coil design have been incorporated in scores of Pennsylvania furnace transformers. These furnace transformers have ranged in size from 250 through 25,000 kva, and from 3175 through 57,735 amps.

This wide range of sizes demonstrates Pennsylvania's complete familiarity and experience with furnace transformer application. Even more important, however, is the record of performance achieved over this entire range — a 20-year record which reveals that there has **never been a low voltage breakdown** on any Pennsylvania furnace transformer utilizing the exclusive helical coil design.

With a background such as this, in both experience and **proved performance,** Pennsylvania Transformer Company is well qualified to satisfy today's highly exacting furnace transformer requirements. Whether you buy your next furnace transformer separately or as part of an installation "package", why not make certain of long-range dependability by specifying Pennsylvania?

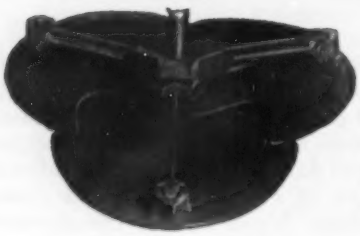
PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • **CANONSBURG** • **PENNA.** • *Greater Pittsburgh District*

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

Voltage Test Bank

(*Continued from page* 130)

conditions at individual substations.

Indicating voltmeter readings are taken periodically at test banks near the feeder load centers. In this way, a close check of the primary voltage throughout the system is maintained. Voltage charts are made as time permits or special conditions may require. Where feeder voltage regulators are between the substation and test bank, readings and charts also serve as a check on the operation of the regulators.

If the primary voltage at the feeder load center is undesirably high, with proper substation voltage, the reason is probably either too many capacitors in service or improper regulator action. If the load center voltage is undesirably low, with proper substation voltage, one or more of the following corrective measures may be employed:

1. Switch in or install additional capacitors.
2. Increase output voltage of feeder voltage regulators if they are present.
3. Install primary voltage boosters.

Indicating voltmeter readings of phase-to-phase and phase-to-neutral voltage are taken periodically at all voltage test banks in order that proper voltage balance can be maintained.

VOLTAGE CHARTS are made continuously at test banks near substations

I-BEAM MONORAIL is suspended from A-frames. Mounted on monorail is a 3-phase trolley line that serves the three hoists geared for travel and lifting

DISTRIBUTION—Maintenance

Monorail Cuts Pole Loading Time

JOHN WALLIN, Northern Division Manager, Puget Sound Power & Light Co, Bellingham, Wash.

Time required for loading poles onto trucks has been reduced from 30 to 10 min in a new pole yard developed by Puget Sound Power & Light Co, Bellingham, Wash. Pole-handling facilities consist of eight A-frames made of cedar poles 35 to 40 ft long, with a 15-ft spread at the base. Average span between the frames is 60 ft.

(*Continued on page* 137)

Note the symbols on the head of this suspension insulator disc. First, the impressed number 406254 (read it 4-062-54) means that Crew No. 4 made it on the 62nd day, or March 3, 1954. The big stamp No. 3 denotes the glazing crew. The stamp "J" is the inspector's mark. Factory records would enable us to name the men who handled it, to find the individual die that formed it, and on what machine, to check the tested composition of the clay and glaze, and to review the laboratory records of statistical control governing the batch of which this insulator is a part. At least a dozen men have "signed their name to it!" We will always be able to back-track through each pair of hands and each process to pin-point a possible improvement.

Insuring the Chance to Make it Better

On the head of each O-B suspension insulator disc is this information: The day it was made, the crew that made it, the crew that glazed it, and the inspector that passed it. Detailed production records can extend this back to a certain batch of clay, to a single forming die, or to the workmanship of an individual. We can examine laboratory reports on the raw material before going into stock, or on destructive M & E tests of a statistical control quantity of finished insulators from the group of which this unit is a part.

Because each piece bears an identity, testing and inspection can lead to more effective manufacturing control, permitting us better to correlate materials, processes, and human skills. And, if at any future time we wanted to trace back the history of some single unit, we would have its complete birth record that might be invaluable in guiding us to possibly more knowledge of our business.

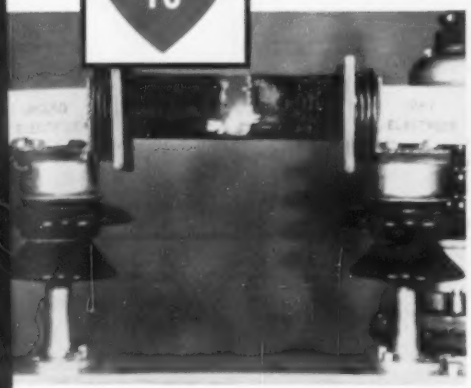
If we seriously intend to maintain and increase fundamental quality, we must be able to back-track through each pair of hands and each process to pin-point a possible improvement.

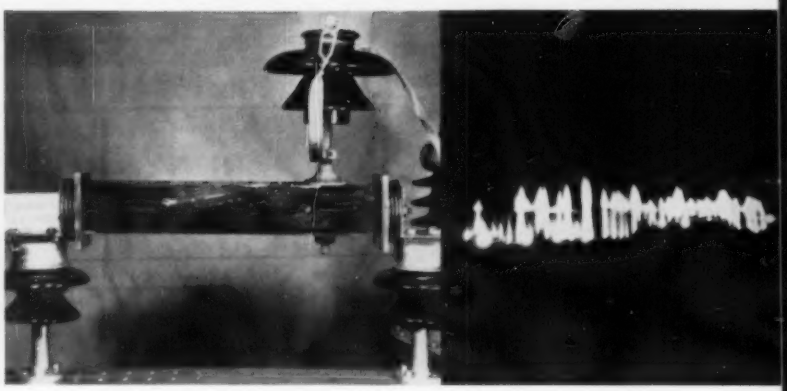
This kind of care -- this acknowledgement that there is still room for improvement in anything, no matter how good, (and we don't want to miss the chance through lack of identity) is one of the most practical aspects of Technical Competence, the heart of every O-B insulator!

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Lt'd., Niagara Falls, Ont.

TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

A Couple of Feet of Scrap Wire

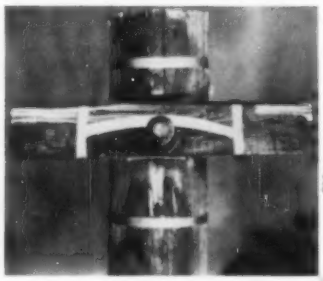


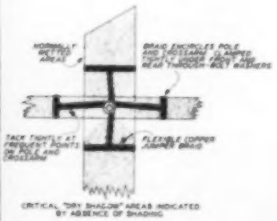


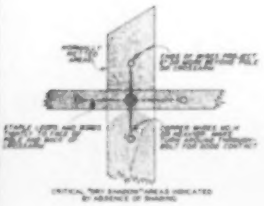
The principle: Electrical break-down over a small dry area on an otherwise wet, conductive pole or crossarm, is the fundamental cause of fires. Such "dry shadows" are created by wind-directed rain or snow. They require a previous dry period to permit the structure to reach a low moisture content, and are then a function of contamination on the insulator combined with gentle, selective wetting. The surge nature of leakage currents involved has been established in our laboratory from the data obtained on our outdoor time-tests.

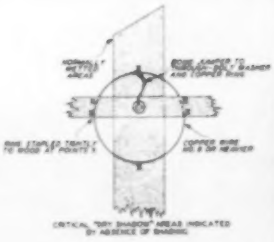
Air-driven spray has lightly wetted wood surfaces and reduced their resistance. Only 10 milliamperes flowing over the crossarm initiated this "tree fire." Heat of the fire has dried progressively longer sections of the grain, and conductivity of these carbonized paths offsets what would otherwise be increasingly longer resistance elements. Note electrical sparking within the wood grain structure. The ultimate result of such a "tree" fire is destruction of the crossarm as shown in the second view. Many such fires die out or are extinguished in their early stage by increased intensity of rain. This accounts for the presence of surface "tree-burn" formations.

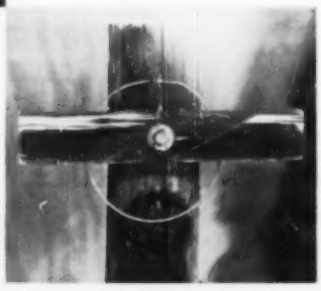
THREE SUGGESTED MEASURES
FOR PREVENTION OF
POLE FIRES BY SHUNTING OUT
"DRY SHADOW" AREAS











Keeps the Fire Department Home

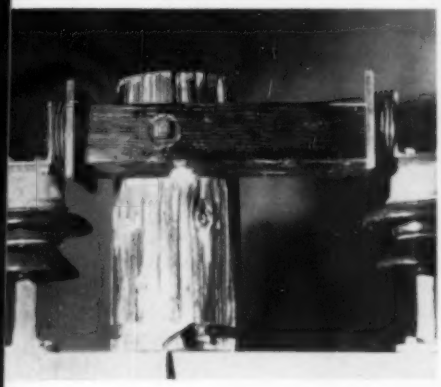
After a day when 14 pole fires were burning at the same time on its property, an exasperated power company came to our laboratory with the question: "What do you know about the cause and, better yet, the cure of such fires?"

No books were available on this subject and no conclusive research had ever been conducted until we undertook to answer the question -- a project that consumed more than two years.

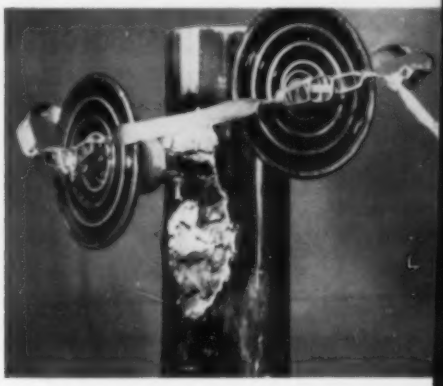
Eventually, a series of factors was closely correlated: (A) Low moisture content of the pole. (B) Presence of conductive contamination on the insulator. (C) A critical degree of precipitation. (D) Wind velocity. (E) Wind direction in relation to elements of the structure. As our knowledge of the subject improved, an observer could describe a certain type of pole fire and, by arranging the volume and angle of water sprays, plus directing a controlled air blast, the laboratory could produce the fire to specification. The technicians became so familiar with the phenomenon that they even predicted a fire on our factory primary service!

As for the cure -- a couple of feet of bare wire stapled to the pole and crossarm, or other equally simple measures. Details of this research project are in the 1947 A.I.E.E. Proceedings under the title, "Burning of Wood Structures by Leakage Currents," as presented before that year's Winter Technical Meeting. A letter addressed to us will secure a copy of this paper without charge.

Behind this is a story far more important than conducting one more piece of useful, practical research relative to insulation and power transmission. First, there are the physical and human facilities of the finest laboratory in the insulator industry. But we go another step back to the attitude of Management that continually fosters and promotes such research in recognition of this important fundamental: that, while machinery and factories may be the mechanism of making an insulator, Technical Competence is the heart of it.



Start of a severe "pocket" fire adjacent to the gain in a pole. Leakage current of 10 milliamperes is flowing from the dampened crossarm surface to the through-bolt, through the dry gain area, and out over the lower surface of the dampened pole to ground. Confinement of such a fire makes it unlikely to be extinguished by natural rain. The second view shows the fire which has progressed to open flame.



One can almost visualize the "shadow" of the suspension insulator on the left against the face of this pole. This is a typical fire as occurring on a deadend. The test was stopped after the point of open flame, in order to relieve smoke conditions in the laboratory although, in the field, destruction would be complete. It will be noted in this and another view, that the insulators are jumpered. The function of the unit in the test is only to cast its shadow rather than to transmit leakage currents. These currents are produced by the test equipment in accordance with known surge data.

the heart of every Ohio Brass insulator

High-Power Transmission Line on a table top

How would you measure a one-half watt increment of clamp loss in a 400-ampere circuit -- measure it easily, that is? Losses in high-power testing equipment would smother the result. But you can use just two amperes and, with a magnetic loop use it 200 times, except that the slight equipment losses are now easily determined and rejected in the final answer.

Magnetic loops, in principle, are "old shoe" around an electrical laboratory. However, the few measurements ever made on hardware watt-loss employed high amperage with the cumbersome Calorimeter method until we were forced by circumstances to find a better way. This came about by our development of non-magnetic hardware and, with it, the necessity for conveniently-obtained data.

Today, the technique we developed for watt-loss measurement has become adopted throughout the industry because of its simplicity and precision.

Not everything we do in our laboratory is necessarily new. Sometimes we go right back to the first chapter in the book for the basic principles which, when ingeniously applied to new problems, put that indefinable extra into our product -- Technical Competence.

Sensitivity of this low-amperage magnetic circuit for measurement of watt-loss in clamps has a very practical aspect. For example: a given size clamp of all-ferrous composition shows a 40-watt loss at 400 amperes. The equivalent clamp with a non-magnetic (aluminum) body, but still retaining the ferrous keeper-piece and U-bolts, shows a 2-watt loss. Substitution of non-ferrous U-bolts reduces the loss to ½-watt; and finally, substitution of an aluminum keeper-piece brings the loss to zero. Since the last two items are non-standard and not useable in standard ferrous clamps, the buyer would complicate his stocking and pay a premium to gain only an additional 5 per cent saving in heat-loss. Because we have been able to evaluate this condition accurately by means of a precision test, we have retained ferrous keeper-pieces and U-bolts in our non-ferrous clamps in the interest of greater convenience and economy for the user.

OHIO BRASS COMPANY, MANSFIELD, OHIO

In Canada—Canadian Ohio Brass Co., Lt'd., Niagara Falls, Ont.

TECHNICAL COMPETENCE

the heart of all Ohio Brass hardware

4515-H

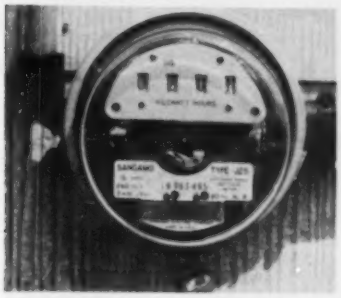
Monorail Cuts Time

(*Continued from page* 132)

Suspended from the frames and bolted to the 6-in, 15½-lb I-beam cross members is a 12-in, 35-lb I-beam monorail. Suspension and sway support is provided by ½-in. guy wires. A 3-phase trolley line paralleling and mounted on the monorail serves three electric hoists geared for travel, raising, and lowering.

Poles are stored in racks at the base of each frame, with one loading stall under each span between two racks. An overhead light on each frame is provided for night operations.

METERING—Operation



PLASTIC COVERED watthour meter provides readability without difficulty

Plastic Meter Covers Cut Replacement Costs

J. W. DYE, Superintendent, Meter & Test Section, Long Island Lighting Co, Hicksville, N. Y.

Using plastic covers on outdoor watthour meters has cut cover replacement costs by ⅓ for Long Island Lighting Co. These plastic covers are being tried on 600 installations where exposure to or persistent breakage have presented special problems. It is expected that net savings in reduced breakage over the life of the meter will pay for the cost of the plastic cover itself.

Cover has high impact strength, resistance to glazing effects, and low cost. It weighs about 11 oz, is easy to handle, and safe to install. Composed of a new material, it was developed in conjunction with a local plastic manufacturer.

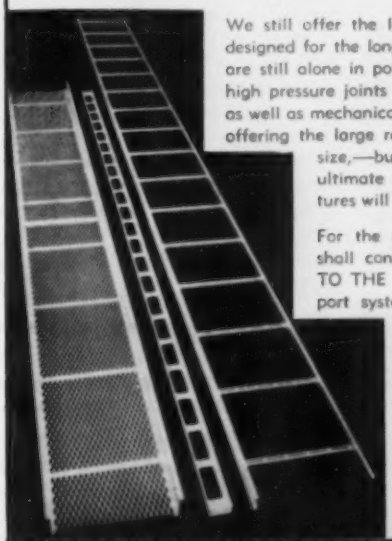
The covers are not affected by weather conditions. They have survived extreme heat waves as well as the coldest weather experienced in Long Island.

ALUMINUM
OR GALVANIZED STEEL
SUPPORT SYSTEMS
FOR POWER AND CONTROL CABLES
IN-FREE-AIR
DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

We are followed

We are proud to be considered the leaders in our field. We specialize in electrical cable support systems and are slowly followed by all others in:

1. The longer lengths we pioneered for field labor savings.
2. The slip-on expanded metal splices originated by us for lower erection costs.
3. The use of structurally sound racks with fully inserted and welded rungs.
4. The principle of designing for long spans to save supports.
5. The use of aluminum to reduce the "installed cost" and give a "maintenance free installation."



We still offer the longest racks, troughs and baskets designed for the longest spans and heaviest loads. We are still alone in pointing out the great importance of high pressure joints for splices to give sound electrical as well as mechanical connections and are also alone in offering the large radii fittings suitable for any cable size,—but hope that, for the benefit of the ultimate user, these and all our other features will also soon be copied.

For the convenience of our customers we shall continue to feature the "COMPLETE TO THE LAST BOLT" electrical cable support system including time-saving installation tools, will continue to help the contractors with lay-outs, take-offs and erection diagrams and will continue to excel in delivery and service rendered. "HUSKY DOESN'T COST—IT PAYS."

AVAILABLE THROUGH LEADING CABLE MANUFACTURERS

HUSKY PRODUCTS, INC.

5300 VINE STREET, CINCINNATI 17, OHIO

New St. Louis Coil Plant Features:

- High Quality Lighting
- Air Conditioning
- Electric Heating

CHARLES T. HEATON, Industrial Engineer, Union Electric Co of Missouri, St. Louis

Air conditioning and high-quality lighting (45 ft-c generally, and 70 to 100 ft-c for special tasks) are features of a new Marlo Coil Co plant in St. Louis. The same units that provide air conditioning in the summer provide heating in winter.

Throughout the planning period Union Electric's lighting specialist, Ernie Stohlmann, and the author, cooperated in supplying lighting layouts and power information.

On the roof of the 200 x 400-ft building are four 40-ton combination air conditioning and heating units.

The guard's quarters, a 14 x 14 ft building, is heated with two 1.8-kw electric heaters.

Plant interior is composed of 30 x 40 ft bays. Each bay contains four 400-w color-corrected mercury lamps, and one two-lamp 96-in. T-12 fluorescent fixture.

These units provide 40 to 45 ft-c throughout the plant. Since mercury lamps require a cooling off period before they can be relit, the fluorescent fixture was installed for safety reasons.

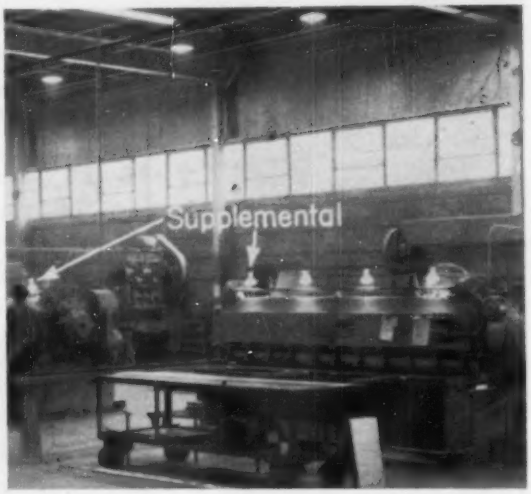
Some jobs require supplementary light. In the machine shop this is provided by 150-w R-40 lamps, mounted to yield 100 ft-c on the work tables.

The two spray-paint booths also required additional light to help painters do better work. Each booth has been lighted with 24 300-w, explosion-proof incandescent units mounted behind frosted glass. They provide 70 ft-c.

An infrared oven rated at 30 kw dries paint rapidly on the smaller units. This oven sits beside the paint booths.

As a further aid to good seeing and pleasant working conditions, each machine is painted a light green. Columns and girders also are painted a pastel color to improve light reflection.

FLUORESCENT MIXED WITH color-corrected mercury vapor lamps provide 45 ft-c general illumination for company men



INTENSIFIED LIGHT (up to 100 ft-c) is shed by the special 150-w R-40's mounted just above spot where light is needed

FANS BLOW COOL AIR over electronic tubes while Univac's brain is checked

Brain 'Washed' by Cold Water and Fans

LEON ALBERTSON, Application Engineer, Philadelphia Electric Co, Philadelphia, Pa.

Overheating of electronic tubes during construction and testing of "Univac" computers at Remington Rand Inc., Eckert-Mauchly Division, Philadelphia, Pa., is prevented by refrigerated water circulated through pipes installed in base of each computer.

Fans blow air over pipes and up through the computer to keep the inside temperature from climbing over 90F. For this work a bank of four 40-ton compressors supply water between 50 and 55F.

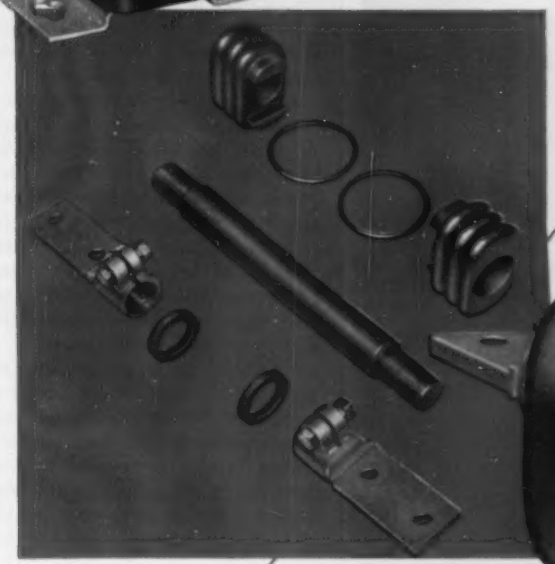
The water is fed through a network of pipes to several locations. This enables construction and testing to run simultaneously in various sections of the department. This electronic computer is the "brain" of the Univac system. It contains about 5,400 tubes.

(*Continued on page* 140)

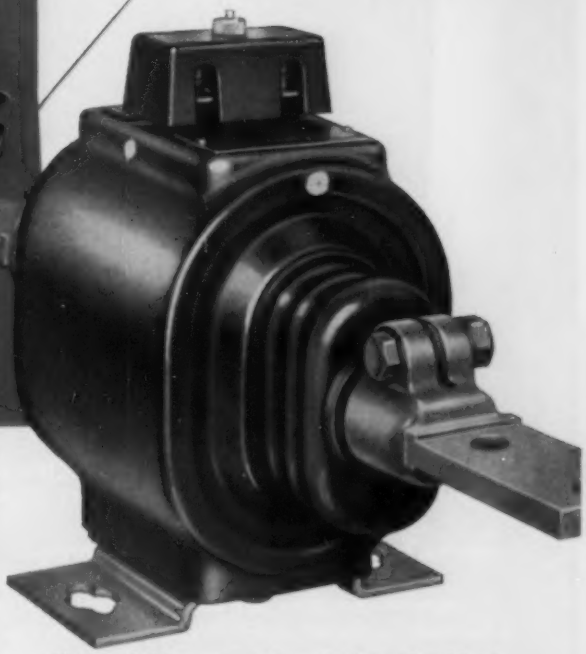
New Current Transformer

"Do-It-Yourself" Kit Solves Stocking Problems

EXTRA LARGE OPENING of 600-volt through-type transformer makes possible easy conversion.



KIT CONTAINS insulated primary conductor, two primary bushing inserts, and two primary terminals with gaskets. Complete instructions make changeover easy.



New "do-it-yourself" kit converts a through-type 600-volt indoor-outdoor current transformer into a bar-type 5000-volt current transformer for either indoor or outdoor use. You get two voltage classifications, four possible uses from a single current transformer. The changeover is easy. Complete inserts and instructions come in a handy kit. You need only one unit in stock for two uses of two voltage classifications. Best of all, by using this kit on a 600-volt unit, you can cut cost of 5-kv metering.

Heart of this cost-cutting, stock-saving idea is Allis-Chalmers molded epoxy resin through-type 600-volt current transformer. It is available for 200-5, 400-5, 600-5 and 800-5 amp ratings, performing satisfactorily up to 200% continuous current. Its large opening is sufficient to take inserts that convert it for 5000-volt service.

Get full information on how you can take advantage of this completely new idea for cutting costs, saving on stocking. See your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wis.

A-4786

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

LUMATROL®

RATES FIRST ON ALL TWELVE SPECIFICATIONS OF PHOTOELECTRIC OUTDOOR LIGHT CONTROLS

Lumatrol is the finest fully automatic lighting control available today. It's compact. It's easy to install on any Luminaire, pole or cross-arm. It features exclusive omni-directional sensitivity for accurate, dependable operation under all conditions of use. It's fail safe. It's low cost.

Before you specify and install street, highway or other outdoor lighting control . . . get all the facts on Lumatrol.

WRITE TODAY FOR TECHNICAL BULLETIN

micro balancing

INCORPORATED

GARDEN CITY PARK, L. I., NEW YORK

® Trade Mark Reg. U.S. Pat. Off.

Silicone Lubricant

. . . is made with help of electric kettles which drive off unwanted products during process

R. F. McSHANE, Power Sales Engineer, Public Service Co Div, Commonwealth Edison Co, Harvey, Ill.

Electric kettles are used for making silicone lubricant at the Copeland and Slack Inc plant in Harvey, Ill. The silicone lubricant is used for cold rolling stainless steel. It has the advantage that it will stand more roll pressure than other lubricants and therefore fewer passes of the steel through the rolls are required.

To produce the lubricant, a chemical solution is put in the kettles. There are two 60-gal kettles and the heating unit in each is 15 kw. The chemical solution is brought up to 350F and kept at that temperature for 24 to 30 hr. The heat drives off the unwanted products and the remainder is a highly concentrated silicone lubricant. The concentrated lubricant is diluted with water by the rolling mill operators.

The electric kettles are preferred to gas kettles because of the accurate temperature control that is possible with electric equipment. Accurate temperature control is essential to this operation. If the temperature climbs too high, a salt is precipitated out of the chemicals ruining the lubricant.

Newspaper Mats Dry Fast Under Vacuum and Heat

J. M. JENNINGS, JR., General Sales Dept, New Orleans Public Service, Inc, New Orleans, La.

The New Orleans *Item* has cut operating costs by installing two electric machines that dry and form paper mats which are used to mold semicylindrical page plates for the press.

These automatic machines turn out more mats in a given period than the former equipment, and the operator can work elsewhere while the mats dry. Each mat emerges exactly as intended. There is no variation in moisture content.

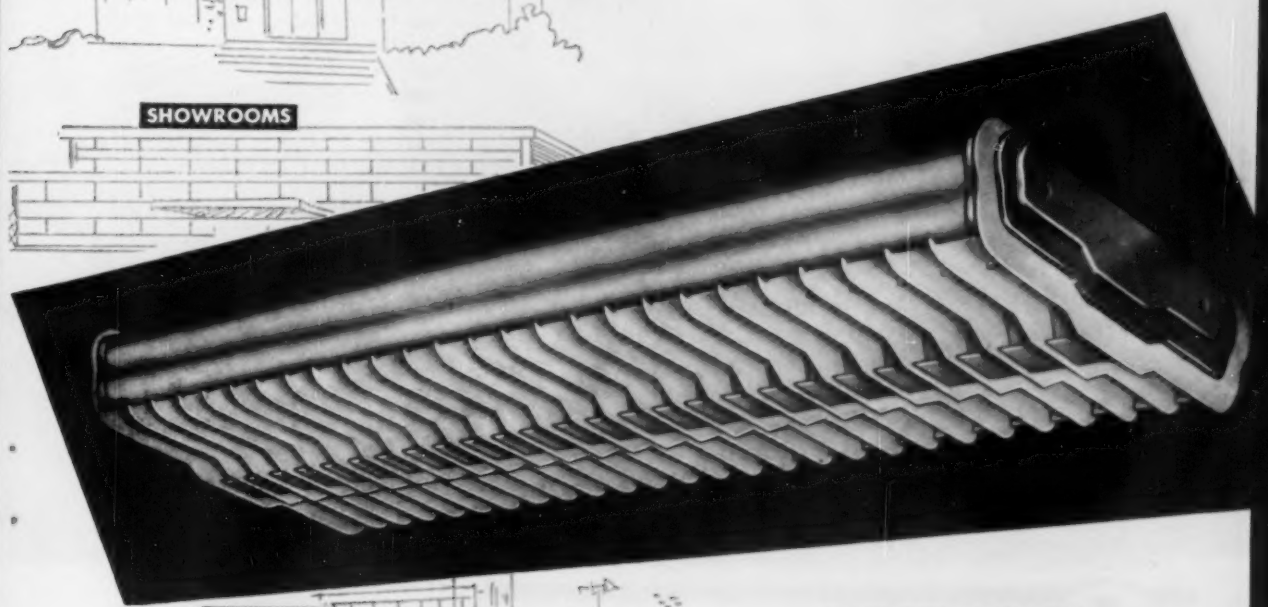
Each machine is equipped with 6.4 kw of electric heaters, a 3-hp vacuum pump, and a timing device. The operator positions the wet mat against the

(*Continued on page* 142)

You see it everywhere . . .

Wheeler FLO-LINER

Proven high efficiency fluorescent lighting for initial installation or replacement. Wheeler-engineered for comfortable low brightness at all normal viewing angles.



**BANKS, HOSPITALS,
RESTAURANTS, HOTELS,
THEATERS, INSURANCE COMPANIES**

**FOR FURTHER INFORMATION,
WRITE FOR BULLETIN NO. 92**

WHEELER REFLECTOR COMPANY
275 Congress Street Boston 10, Mass.
Distributed Exclusively through Electrical Wholesale

EASILY INSTALLED! Guard against damaging high concentrated pressures at dead-ends . . . avoid outages with Preformed Dead-Ends. They firmly hold the conductor snugly and securely with a "velvet-glove" grip. Make them your standard dead-end for both insulated and bare conductors.

They are the easiest installed dead-ends you've ever used. Proved by extensive tests, both in the laboratory and in the field, Preformed Dead-Ends withstand tremendous strain even under constant intermittent loading conditions.

Prove to yourself that they are outstanding—both in service life and economy. Write or call for more facts. Telephone Cleveland: EX-1-3571.

Made in accordance with or for use under one or more of the following U. S. Patents: 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PLP **PREFORMED LINE PRODUCTS CO.**

5349 ST. CLAIR AVENUE · CLEVELAND 3, OHIO

Newspaper Mats

(*Continued from page* 140)

DRYING PAGE MATS for New Orleans *Item* is accurate and semi-automatic

underside of the raised cover. The vacuum grips the mat tightly. The cover is lowered to the closed position, and the heaters are switched on. At the end of the pre-set period, about 2½ min, the timer rings a bell to attract the operator's attention. It also trips the cover's latch, and the cover swings up automatically.

1960 Factories . . .

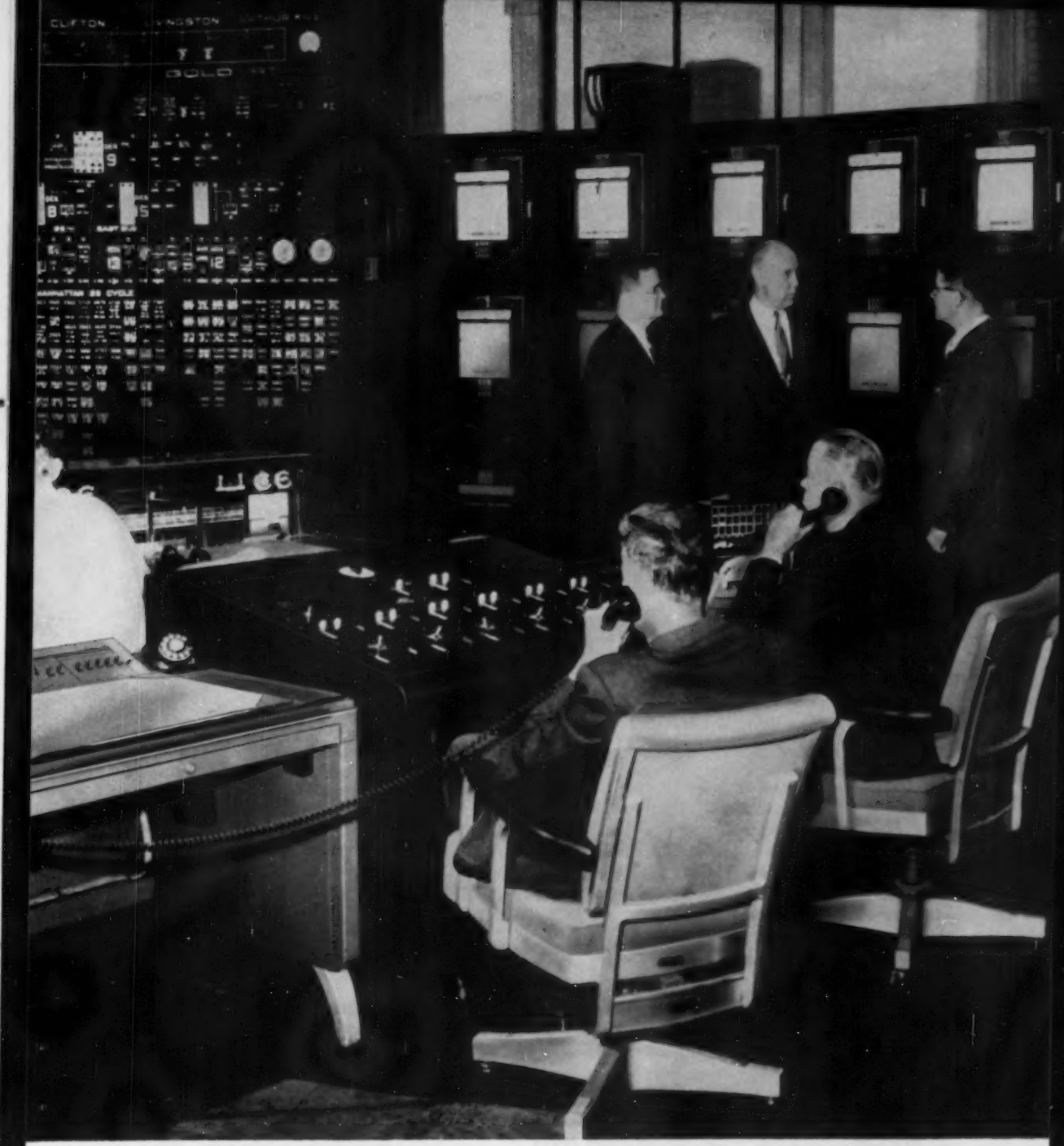
. . . will be air conditioned to raise production efficiency

Practically all factories built in 1960 will have air conditioning because management is recognizing it as a production tool. Only 20% of today's new industrial construction includes it.

G. K. Iwashita, general manager of General Electric's industrial air conditioning department, declared that hot weather caused an annual production loss of $108 per employee, according to one survey. Specific findings: More refreshment breaks, earlier shutdown of machines at ends of shifts, higher absenteeism during 100 hot days, more sluggish employees with lower morale.

"Recovery rooms" are the answer for plants that do not lend themselves to air conditioning. Fatigued men recover more quickly in these rooms than in the shade outdoors.

(*Industrial Briefs on page* 144)



Experience makes the difference . . . in the design and operation of Load-Frequency Control centers such as this New York City Consolidated Edison System Operator's Office. Here, the control must automatically allocate a 1400-MW load pick-up each morning among six of the system's generating plants—and maintain good stack appearance at the same time.

The control was matched to system requirements by Con Edison and a team of Leeds & Northrup Design and Sales Engineers, two of whom are shown with Charles Metcalf, Con Edison Engineer (standing, second from right).

For a reprint of an AIEE paper describing the design and operation of this installation, contact L&N men in any of 18 District Offices, or at 4904 Stenton Ave., Phila. 44, Pa.—"their experience makes the difference."

LEEDS NORTHRUP

300 Load-Frequency Control Installations 1927-55

Jrl. Ad 461-8(2)

New construction and operating features . . .

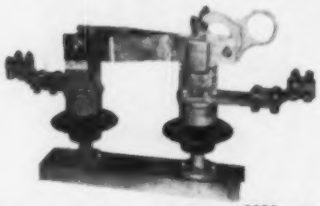
THE ROYAL TYPE BT SWITCH

• • • • using previously proved sound design as a basis, has been engineered to achieve a clean cut, simple, and positive operating switch

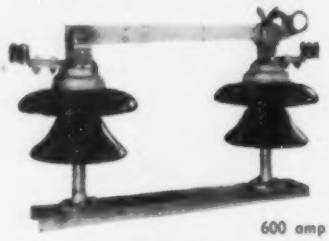
CLEAN CUT • SIMPLE • POSITIVE

Parts above insulators are all non-ferrous

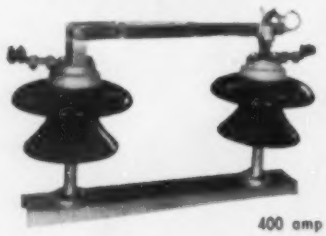
THE completely housed contact affords maximum protection against snow, sleet, and dirt. The positive latch acting on blade adjusts automatically for dimensional variations due to temperature changes, mountings, or insulator deflection. Large area TONGUE TYPE front and hinge contacts are machined and ground to close tolerances. Heavy pull rings with pry-out feature and large eyes are provided. These rings are easily found, even at night, with a hook stick. 90° blade stops are optional. Grind finish contact surfaces provide multiplicity-of-point contact. These surfaces are heavily silvered, with the silver metallurgically bonded to the contact surfaces. Trussed type copper blades insure rigidity.



1200 amp



600 amp



400 amp

Royal

A Part of the Arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRIC MANUFACTURING COMPANY

INCORPORATED

1122 EAST 97th STREET Chicago 19, Ill.

Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

INDUSTRIAL BRIEFS

Handling logs with a small overhead monorail hoist has enabled White and Wingate's Dauphin Mill, north of Harrisburg, Pa., to use two men elsewhere in milling operations. Formerly three men were required to unload and store logs prior to sawing. Estimated cost of operating a one-ton hoist of this type was only $31 a year. Joe Mumma, Industrial Representative, Pennsylvania Power & Light Co, Harrisburg, Pa.

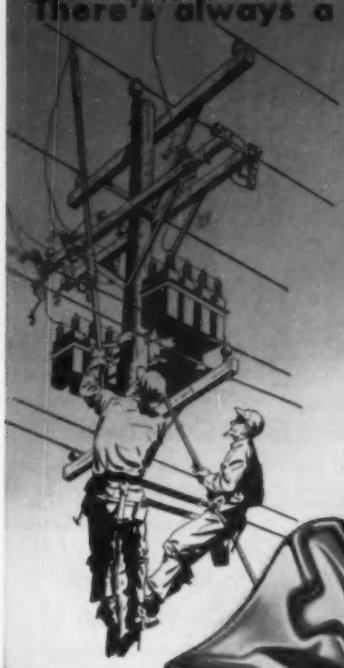
Keeping hydraulic oil warm in a reservoir tank of a baling machine has prevented cold starts during bitter winter weather. Immersion heaters were installed in the 400-gal tank at West End Iron and Metal scrap yard, Duluth, Minn. They maintain a temperature of not less than 55F during the coldest weather. These two 9-kw heaters have eliminated previous excessive loads on pumps and motors. A space heater had been considered to heat the concrete building housing the reservoir tanks, but substantial savings have resulted through use of immersion heaters. Glen J. Alden, Industrial Sales Engineer, Minnesota Power & Light Co, Duluth, Minn.

Increasing the flexibility of a paraffining machine was the sought-after goal at Paper Products Co, Inc, Cincinnati, Ohio, when an 1,800-w radiant heater was added to the device. Installed above the top pressure roller, the heater enables the machine to apply plastic as well as wax coatings to the box board handled by this machine. With slight modifications, the heater also enables the machine to coat both sides of the box board at once. Formerly coating only one side at a time was possible. Thomas V. Morrow, Power Engineer, Cincinnati Gas & Electric Co, Cincinnati, Ohio.

Preventing freeze-ups in an emergency water pump house has been accomplished at Sylvania Electric Products Inc's electronic tube plant, Mill Hall, Pa., with installation of a 5-kw electric unit heater. This has enabled the user to capitalize upon lower fire insurance rates. The thermostatically controlled heater has proved satisfactory, costing little to install, operate, and maintain. Harry Moore, Industrial Representative, Pennsylvania Power & Light Co, Williamsport, Pa.

There's always a CHANCE for a better connection . . .

AGP* proved best by test for joining aluminum and copper conductors



Chance AGP Clamps, approved by power company after power company on *the basis of their own tests*, can be used for all types of connections: copper to copper, copper to aluminum, aluminum to aluminum, and aluminum to copper.

Chance FORTIFIED cadmium coating, applied .001" thick to the aluminum body of the clamp, resists corrosion and electrolysis in all types of connections. This high density FORTIFIED cadmium coating gives extra long life protection to both the clamp and the conductor.

AGP tap clamps have the advantage of light weight which lengthens conductor life by minimizing the effects of vibration and makes them easy to handle on a clamp stick . . . plus easy identification with the RED EYE SCREW—plus their most important feature, their versatility. You can reduce your inventory and greatly simplify your stocks by standardizing on AGP.

* Aluminum General Purpose

Chance "P.C." (Protected Connection) Clamps

Complete thread protection for easy installation and removal. No threads are ever exposed except in the extreme opennd position. Wide jaws contact all stronds.

Chance Perma-Grip Tap Clamps

Here's a service-proved tap clamp for all general applications. Gripping jaws of this clamp make a three-point contact with conductor.

Chance Z.I.n. 100— Electrical Contact Sealing Paste

For use with hot line clamps, bolted and compression type connectors.

1. Protects any bimetal combination against corrosion and 2. Improves conductivity. 3. Z.I.n. 100 is waterproof and stays plastic. 4. Will not melt under 340° and 5. Can be "worked" at 25° below zero. 6. Non-toxic. 7. Non inflammable. Available in 5 fluid oz tubes or 1 qt. cans.

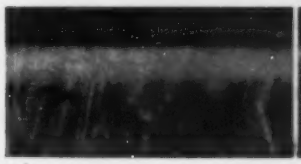
Application brush available for hand use or hot stick.

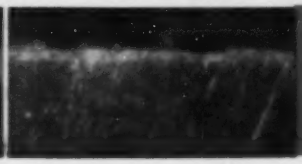
Chance AGP Parallel Groove Clamps

Here's a Parallel Groove Clamp for all conductor combinations that doesn't need an insert and can't be put on wrong. Either side will take copper or aluminum and give you the best parallel groove clamp connection you can get. The wide jaws of this clamp contact every strand of the conductor making a positive, high conductivity connection.

Each size covers a wide conductor range.

Micro-photo below compares Chance A.G.P. fortified cadmium coating (left) to commercial plating, one reason for A.G.P.'s success. Get the full story.





A·B·CHANCE CO.
CENTRALIA, MISSOURI

EEI to Give Dryers Added Push

'56 Coordinated Campaigns will feature two dryer promotions; executives see good year ahead for residential sales, urge more utility and industry tie-in

Clothes dryers—one of the hottest items on the electrical merchandising scene today—are going to be given a double promotional push in next year's Edison Electric Institute Coordinated Promotional Programs.

With separate activities slated for spring and fall, the clothes dryer will join with electric ranges and housewares in getting two-time attention during the year's campaigns.

Mounting enthusiasm for next year's sales outlook and success of the coordinated programs has been sounded by several EEI officials.

Said O. Rodney Doerr, chairman of EEI's Commercial Division Executive Committee and vice president of Pacific Gas and Electric Co: "1956 portends to be a milestone year for the sale of electric appliances and the entire electric industry has an important stake in helping to achieve the goal created by this large sales potential. However, since only by working together can this be done, the best way to get maximum results from our efforts is through coordinated action."

Here's '56 EEI Campaign Calendar and Themes

CLOTHES DRYER (spring)	Jan-Feb-Mar	Like Magic—No Trick, Drying's Slick
WATER HEATER	Mar-Apr-May	Why Worry—Get an Electric Water Heater
RANGE (Spring)	Mar-Apr-May	White Glove Cooking
FOOD FREEZER	May-Jun-Jul-Aug	Freezer Living is Leisure Living
SMALL LOAD BUILDERS (Spring)	May-Jun	Be Modern—Give Electrical Gifts
CLOTHES DRYER (Fall)	Sep-Oct-Nov	(To Be Announced)
RANGE (Fall)	Sep-Oct-Nov	(To Be Announced)
SMALL LOAD BUILDERS (Fall)	Oct-Nov-Dec	Make Christmas Giving Mean Better Living

Those Who Use 'Em, Like 'Em

Robert L. Coe, chairman of EEI's Residential Promotion Committee and residential sales director of Union Electric Co of Missouri, urged greater use of the programs by electric utilities and tighter promotional coordination between utilities, manufacturers, distributors and dealers in carrying them out. The man who is directly responsible for preparation of the programs, Coe pointed out that utilities who have used the programs have found them "an excellent aid to greater sales," and "with bigger and better programs in 1956, electric appliance sales can be the largest in history."

He cited two key reasons for this: (1) Business is good and probably will be better. (2) The electrical industry has the initiative because the trend today is toward greater electrical usage.

H. S. Bennion, EEI vice president and managing director, called for more concentrated selling of those devices which can improve load factor and earnings. He noted that margin of reserve generating capacity next year will stand at about 21%. With 15% considered a desirable reserve for most sections of the country, this was reason enough, he said, for a "pulling together" to give a more pronounced impact to our sales efforts.

Coe stressed the fact that the EEI programs and materials are provided only as a base upon which all interested elements in the industry can build coordinated campaigns. Electrical appliance manufacturers, distributors and dealers can utilize the program theme and calendar in coordinating their sales promotion and sales programs to benefit the industry-wide activity. Each local utility determines the extent of its participation and provides leadership necessary for coordination with the national activities of the manufacturers, national magazines, and other interested industry groups.

He gave credit for much of the coordinated campaigns' success so far to the guidance of Public Utilities Advertising Association representatives.

"Their work in developing themes and materials which fitted the industry's needs, and work with allied industries has been most helpful."

Dishwasher Sales Up in Cincinnati Test

Automatic dishwasher sales in Cincinnati—test city for National Electrical Manufacturers Association's new dishwasher promotion (EW, July 25, p 136)—are shaping up better than even the most optimistic expected.

Distributors reported that in only four weeks of the promotion their sales to dealers amounted to 25 to 50% of their usual yearly business.

Dealers said they were selling dishwashers to 8% of the prospects who came to their stores, and they expect to sell an additional 3% in the near future.

Cincinnati Gas & Electric Co, who worked with NEMA's Household Sink Units section and a local newspaper in staging the four-week event, called it "terrifically successful—the

(*Continued on page* 150)

America's Finest Porcelain..

for Special Applications . . .

VICTOR

Purified Porcelain

Victor "know-how" has made many contributions to insulator progress. None is as important as *Purified* Porcelain. By instituting demineralization of water, modern microscreening, infrared drying, black light inspection, continuous electrical testing and many other advances, VICTOR gives you the finest insulator porcelain ever made!

VICTOR *Purified* Porcelain is ideal for special applications such as molded, extruded, and turned shapes. It has vastly greater uniformity in mechanical and electrical strength values, higher puncture voltage values, greater density, hardness and durability.

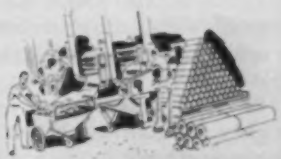
Our engineering, design and manufacturing facilities are ready to help you with specialized insulator problems. Write us.

FEATURES OF PURIFIED PORCELAIN

- Greater hardness and density
- Greater resistance to impact
- Greater thermal resistance
- Higher average puncture values
- Higher mechanical strength
- Takes a smoother, harder glaze
- Uniformity of quality available in no other porcelain

For the full facts on VICTOR "know-how," write for "The Story of Victor and Purified Porcelain." For engineering data on Victor's complete line of standard transmission and distribution insulators, write for Bulletin No. 4.

NEWS FROM VICTOR



With the completion of a brand new addition to its plant last year, Victor has almost doubled the area devoted to bushing and special porcelain manufacture. The new building was made necessary by increasing demands for special porcelain shapes made of Purified Porcelain.

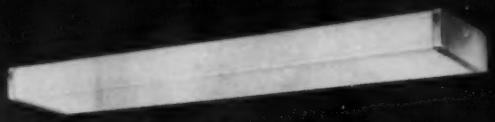
SPECIFY VICTOR

Purified Porcelain Special Insulators

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

The SUBURBAN
. . . with Extruded Plastic Diffuser

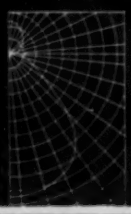


S240	2 lamp 48" Rapid Start
S220	2 lamp 24" Trigger Start
S420	4 lamp 24" Trigger Start
S440	4 lamp 48" Rapid Start

TYPICAL PERFORMANCE CURVE

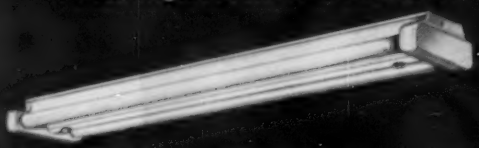
The MERCHANT
. . . with Lucite® Diamond Lens

M242	2 lamp 48" Rapid Start
M442	4 lamp 48" Rapid Start

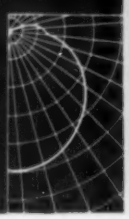


TYPICAL PERFORMANCE CURVE

The SUPERMARKETER
. . . for high levels of illumination

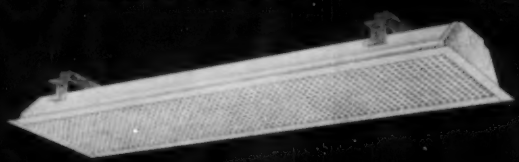


72B4	2 lamp 48" Rapid Start
72B8	2 lamp 96" Rapid Start
74B4	4 lamp 48" Rapid Start
74B8	4 lamp 96" Rapid Start



TYPICAL PERFORMANCE CURVE

The Packaged TROFFER
. . . with Plastic Louver



T240	2 lamp 48" Rapid Start

TYPICAL PERFORMANCE CURVE

NOW! LIGHTING SELECTION MADE
. . . with the new Miller Merchandise Line of

Here is a completely new concept in modern lighting—four basic fixture types with tremendous flexibility and unusually broad application. Slim and handsome in appearance, they provide new highs in lighting efficiency and meet the most exacting requirements for modern layout planning and ease of installation.

Styled by one of America's leading architect-designers, the SUBURBAN and the MERCHANT are strikingly handsome fixtures, extremely shallow with smooth, trim, modern lines. The Packaged TROFFER, only 4½" in depth (fits any 5" recess) is complete with lay-in enclosure, integral side and snap-on end trim flanges, adjustable hanger brackets and Universal furring clips. The SUPERMARKETER is designed to provide high levels of illumination in modern merchandising areas.

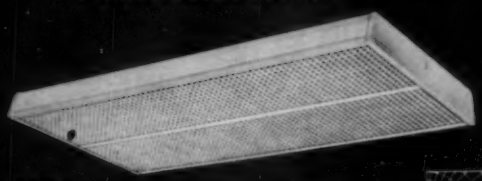
The Miller Merchandise Line goes hand-in-hand with today's increasing trend for lower ceilings. When flush mounted, The SUBURBAN, MERCHANT and SUPERMARKETER provide even ceiling illumination so necessary in minimizing glare and contrast. When stem-suspended, special top apertures produce additional upward light.

ADDITIONAL ADVANTAGES of the MILLER MERCHANDISE LINE

- Hot-sprayed baked enamel on Bonderized 20-gauge steel
- Newest plastics for continuing light stability; guaranteed free from discoloration, warpage for one year
- Bonderite, UL, AFL-IBEW Labels
- All fixtures wired with ETL Certified HPF ballasts . . . readily accessible for very easy maintenance

Ask your Miller representative for complete information about the new MILLER MERCHANDISE LINE

The MERCHANT
. . . with Plastic Louver



M440 . . . . 4 lamp 48" Rapid Start

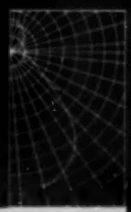
M240 . . . . 2 lamp 48" Rapid Start

TYPICAL PERFORMANCE CURVE

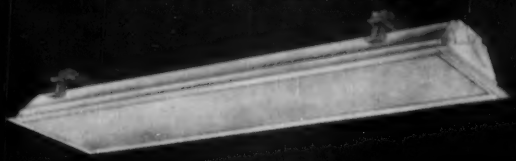
The MERCHANT
. . . with Corrugated Plastic Enclosure

M100 . . . . . 2 lamp 48" Rapid Start

TYPICAL PERFORMANCE CURVE



The Packaged TROFFER
. . . with Lucite® Diamond Lens



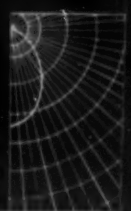
T242 . . . . . 2 lamp 48" Rapid Start

TYPICAL PERFORMANCE CURVE

The Packaged TROFFER
. . . with Corrugated Plastic Enclosure

T244 . . . . . 2 lamp 48" Rapid Start

TYPICAL PERFORMANCE CURVE



*(R)DuPont Co.

EASIER THAN EVER BEFORE

completely-packaged fluorescent fixtures!

JUST 4 BASIC FIXTURE TYPES . . . all Rapid Start*, all Engineered for Quality Illumination and Peak Performance. . . for Modern Lighting in Stores, Schools, Offices and Public Buildings

*EXCEPT MODELS S220 & S420

PARTICIPATING IN SCHOOLROOM PROGRESS, U.S.A.

miller

SINCE 1844

GENERAL OFFICES, MERIDEN, CONN.
FACTORIES: Utica, Ohio — Meriden, Conn.
In Canada: Curtis Lighting of Canada Ltd., Toronto

THE MILLER COMPANY, Illuminating Division
99D Center Street
Meriden, Connecticut

Please send me your complete catalog on the new MILLER MERCHANDISE LINE

Name.....

Company.....

Address.....

.....

Why did "Electrical World" study call Commercial Cooking *"The utilities' poor little rich load"?*

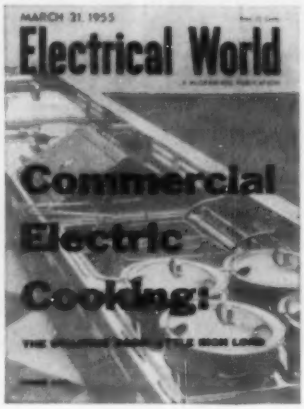
Write for this revealing study today—a profit story that light and power company executives can't afford to miss!

Frankly, we have never seen a more complete, more factual study of how Commercial Electric Cooking affects light and power companies. It was made by ELECTRICAL WORLD, backed by the reputation of that publication for accuracy and thoroughness.

The magazine's editors wanted the facts. Utilities across the nation were surveyed, and in the 12-page study that resulted from this thorough search for facts, 43 of these companies who are "cooking up big sales" tell you how they do it.

Here are some of the startling facts the study reveals:

- The food-service industry is nation's 4th largest, and expects to double annual sales to $35 billion by 1970.
- Each food-service operator represents potential load of 30 Kw.
- Commercial cooking brings in $23 per Kw in Estimated Annual Revenue—up to $690 added EAR per eating place.
- To get $1.00 in new revenue from Commercial Cooking, average utility surveyed spends just 32.2¢.
- Leaders in field are adding new load per customer at rate of 3 Kws and more yearly—yet for most part Commercial Cooking is "*Utilities' Poor Little Rich Load*," a lucrative market waiting to be tapped.



There are case histories, too—filled with information that can be applied in your own territory. Top executives tell the facts in their own words. President Charles E. Oakes of Pennsylvania Power & Light Co., for example, reports revenues of $2 million, saying: "Since 1946 we have added approximately 87,800 Kw of commercial electric cooking load. We estimate our annual revenue from this load to be in excess of $2 million."

To get your copy of this revealing report without cost, have your secretary write to us today for study entitled: *Commercial Electric Cooking—Utilities' Poor Little Rich Load*. It will be mailed to you promptly. For the answers to specific questions, please communicate with any of the member companies listed below.

COMMERCIAL COOKING EQUIPMENT SECTION
National Electrical Manufacturers Association • 155 East 44th Street, New York 17, N. Y.

ASSOCIATED PRODUCTS, INC. • CORY CORPORATION • GRISWOLD MANUFACTURING CO.
HOTPOINT COMPANY • MARKET FORGE CO. • ROYCE L. PARKER, INC.
SAVORY EQUIPMENT, INC. • THE SILEX COMPANY • STAR MANUFACTURING CO.
TOASTMASTER PRODUCTS DIVISION McGRAW ELECTRIC COMPANY
WELLS MANUFACTURING CO. • EDWARD L. WIEGAND CO.

Dishwasher Sales Up

(*Continued from page* 146)

most complete promotion Cincinnati ever had."

Edward P. Hodgetts, CG&E's director of promotion, advertising and publicity, said the campaign would serve as a pattern for future promotions.

Basic sales weapon was demonstration. Some 40,000 people saw 10,000 dishwasher demonstrations at CG&E's lobby and at other locations throughout the city.

One dealer sold three out of six prospects after they had seen CG&E demonstrations. Another dealer sold dishwashers he had had in stock for a year. Still another had to have an automatic electric dishwasher flown in by air express to satisfy an eager customer.

Nearly 100 dealers and 31 distributors participated in the promotion. The Cincinnati Post ran a special 12-page supplement on opening day. Other promotion activities included 101 radio spots on seven local radio stations; 600 car cards in 600 buses; 60 billboards all over the city.

Need Water Systems Says Missouri Farm Survey

What do surveys of the farm market reveal?

Missouri's Farm Electric Utilization Council has undertaken one in that state to find out. Among its findings:

- Farm and home electric water systems are most needed.
- Only 23% of all Missouri farms have an electric water pump and only 23% of those that have electricity are so equipped.
- Home freezers, farm shop equipment, water heaters, portable motors, feed drying equipment and adequate farmstead and home lighting likewise are in deficient number.

Lack of purchasing power was the reason assigned by the survey for farmers in the area not buying. This was blamed on poor crops brought on by a long continued drought and attendent low prices.

The survey was carried out by the state's rural electric cooperatives, electric power companies, and county farm extension agents.

(*More S & S on page* 152)

UPTEGRAFF

TYPE UD

OVERHEAD TRANSFORMERS

for power distribution

WINDINGS

Long life is assured by the generous use of high rag-content fullerboard insulation, tied-in turns to meet short circuit forces and heat-reactive insulating varnishes.

CORE

Made from high-grade oriented-type steel. Has low exciting current and low noise level, and remains permanently tight to insure consistent, quiet performance.

TAP CHANGERS

Uptegraff designs feature accessibility, legibility, short-circuit capacity, non-deformable mountings, 360° rotation stops and exceptionally high insulation strength.

BUSHINGS

Securely clamped internally, with generous gasket area to prevent failure of seals. High-voltage bushings (under 15 KV) have spring-loaded contacts; low-voltage have tinned contacts; both for either copper or aluminum conductors.

TANKS

All parts are welded. Shot blasting assures adhesion of primer and finish coats of durable transformer paint. Rolled flange on cover permits high-pressure uniform gasket seal.

SIZES AND RATINGS

Type UD Transformers are built in sizes from 3 KVA to 100 KVA with ratings up to 15 KV.

Write for free copy of new bulletin that details characteristics and other pertinent data.

R. E. UPTEGRAFF MANUFACTURING CO.
Scottdale, Pennsylvania

R. E. Uptegraff Manufacturing Co.
Scottdale, Pa.

NAME_____

ADDRESS_____

CITY_____ STATE_____

EW

You'll like Porcelain Products' metal reinforced No. 1986 wireholder. They're built to standards of ruggedness and reliability that assure top performance for generations. Metal in tension, porcelain in compression—hot dip galvanized steel parts—extra sharp, lubricated threads—large pulley-action wire hole makes this the finest wireholder on the market.

A complete line of secondary service materials built to the same high standards of quality and dependability are also available for every service installation.

You can depend on the name Porcelain Products —the byword for "Quality" for more than 60 years.

ELECTRICAL PORCELAIN SINCE 1894

61 years

Porcelain Products, Inc.

PP —INC—

FINDLAY, OHIO

Farm Wiring Upped

Wiring Design Committee revises Farm Wiring Manual, urges 200-amp service panels

New, upgraded wiring standards for America's farms are set forth in the revised edition of the "Farmstead Wiring Handbook" just off the press.

Published by the Industry Committee on Interior Wiring Design, the new 48-page manual supersedes an original edition issued in 1946.

Made necessary by the farmer's rapidly expanding use of electrical farm production equipment, the new edition is a sequel to the committee's "Residential Wiring Handbook" published last year. It sets down a list of minimum recommendations on such things as sizes of wire, number and location of electric outlets.

Some of the handbook's changes and additions:

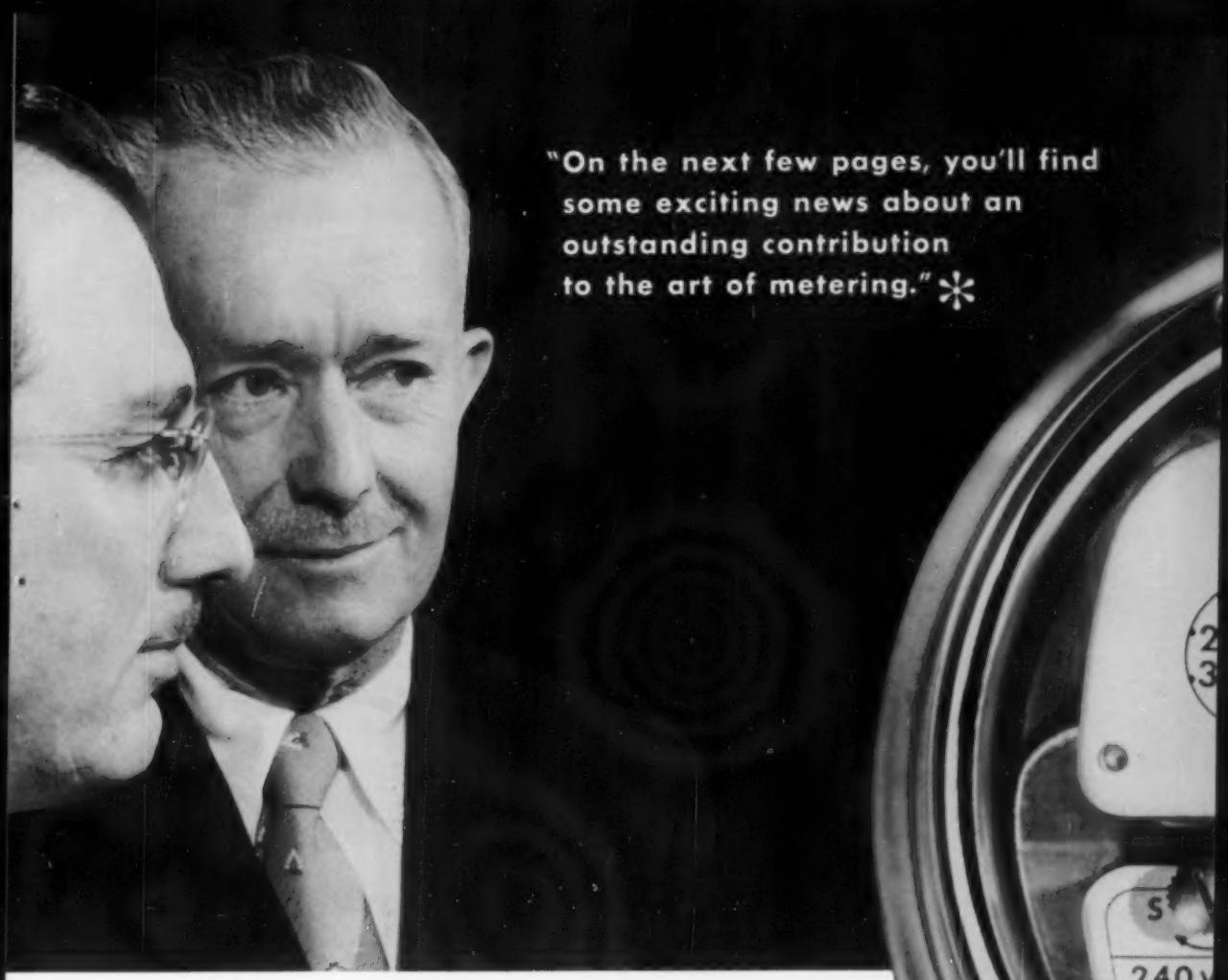
- Service entrance panels now in most cases should be 200-amp or larger, and service entrance conductors should be no smaller than No. 2 copper or No. 0 aluminum.
- All branch circuits in farm buildings are now recommended to be 20 amp.
- For the first time a minimum wire size (No. 12) is recommended for branch circuits.
- Wiring for such new farming wrinkles as milking pits, automatic feeders, silo unloaders, hotbeds and heat lamps over drinking and feeding areas are discussed for the first time.

230-V Causing Strain

Just how much greater use the farmer is making of electric power is shown in these facts: In 1930, says the handbook, a three-wire, 60-amp electrical connection was considered adequate to service most farms. By the end of World War II, 60 to 100 amp or more were needed. Today, an upsurge in the development and purchase of new equipment, particularly that operating on 230 v, is putting a still greater strain on most farms' wiring. Thus, some farmers are finding even 200-amp service to be inadequate.

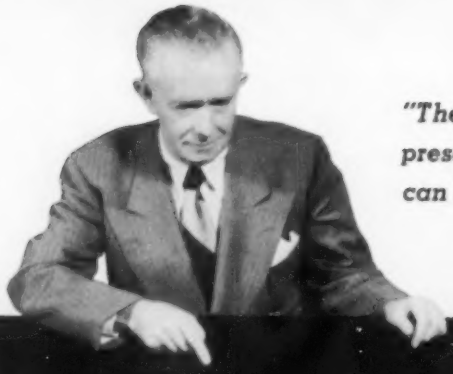
The handbook is divided into three sections: Interior wiring design, outdoor electrical distribution, and a series of tables which show wire sizes needed to carry various electrical

(*Continued on page* 161)



The new Westinghouse *Lifetime* meter...

*Dick Blevins, right, Westinghouse Meter Division Sales Manager, discusses the new meter with Carroll Roseberry, Manager, Electric Utility Sales. On the next seven pages, Dick will discuss the new Lifetime meter with you.



"These Lifetime meters will handle all present and future single-phase loads that can be served without transformers."

Type DA—15 amperes

Type DS—15 amperes
30 amperes

The *Lifetime* meter guarantee

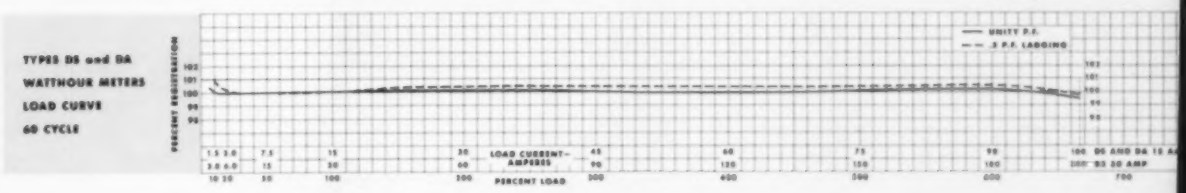
Westinghouse, in connection with Types DA and DS meters, will replace any defective part which fails under proper and normal use during the life of the meter which, for the purpose of this guarantee, is thirty (30) years from date of shipment. The replacement part will be shipped prepaid, and such shipment shall fulfill all Westinghouse obligations in respect to said meter. Westinghouse shall not be liable for consequential damages.

Why the Guarantee is Possible

There are five major factors that determine the life of a watthour meter. The superiority of the DS and DA meters on these points assures lifetime performance. These points are:

1. Range—sufficient load range to take care of present and future loads.
2. Thermal Capacity—the ability to give good service and long life at extreme temperatures and high overloads.
3. High Insulation Level—the ability to withstand high-voltage surges without damage.
4. Stability—long-time accuracy of a meter is possible only when the meter is inherently stable mechanically, electrically and magnetically.
5. Corrosion Protection—all materials and finishes must be selected and coordinated to give maximum protection against corrosion for long life, low maintenance.

The manner in which the Lifetime meter meets each of these qualifications is shown below and on the following pages.



Enough range and thermal capacity for all single-phase loads

Electric utilities are now faced with the necessity of replacing many old meter installations because they do not have the range and thermal capacity required for modern loads.

For the replacement of such meters and to provide for any single-phase metering requirements in the foreseeable future, Westinghouse has introduced the Lifetime meter—a meter with a truly amazing range. It will measure accurately all loads from less than 0.1 ampere to 200 amperes.

Lifetime meters are offered in two ratings—Type A (bottom-connected construction) and Type S (socket construction) to handle loads up to 100 amperes, and in the S-mounting to handle up to 200 amperes.

TURN THE PAGE

YOU CAN BE **SURE**...IF IT'S
Westinghouse

New insulating compounds give high insulation level

Both the current and the potential coils in the Lifetime meter have a 10,000-volt insulation level. Surge protection is provided in DS meters by De-ion® arrester gaps located in the back of the base and arranged to discharge outside the meter. In the DA meter, relief gaps are provided between the series windings and the base.

These gaps discharge at approximately 4500 volts, well under the 10,000-volt insulation of the coils. They drain off surges before any damage can be done.

The current coil is form wound to exact dimensions, using an extra-heavy conductor that insures high thermal capacity. A new polyester compound insulates the current coils and is molded to the laminations. This insulation has high dielectric strength, will not absorb moisture or give off corrosive fumes, and is free from deterioration due to time and temperature.

This method of coil manufacture results in an unusual degree of uniformity—a vital factor in meter accuracy. It also makes for long coil life and low maintenance.

Greater stability for long-time accuracy

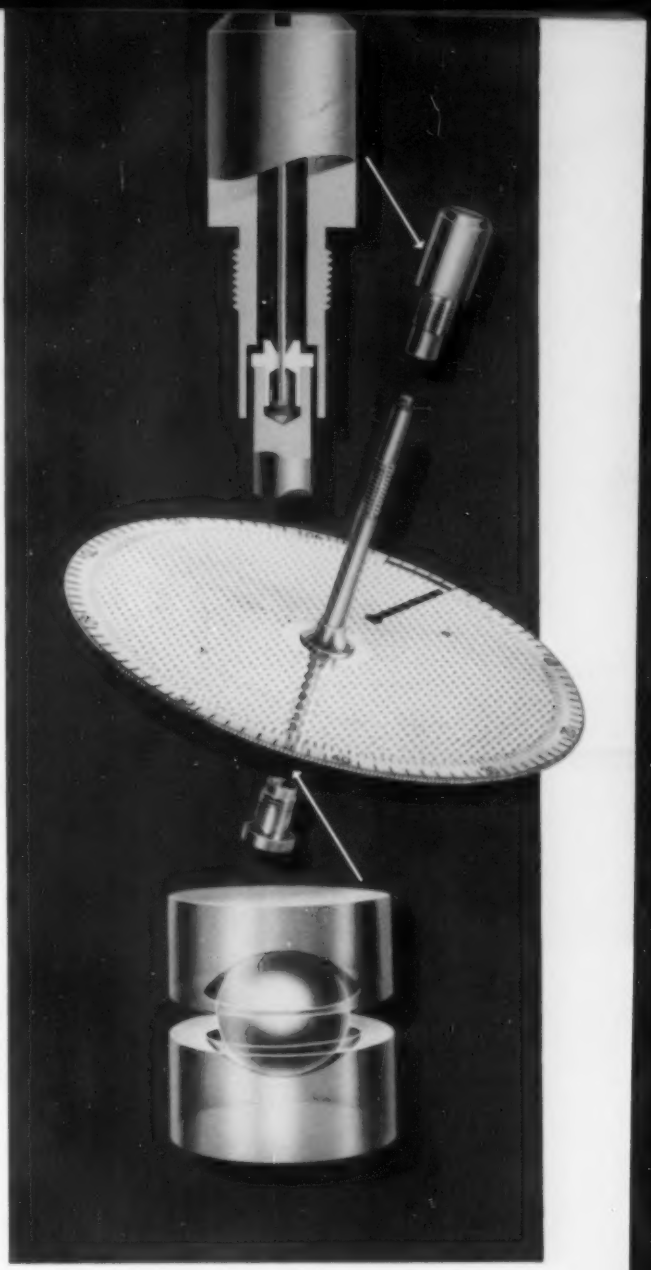
The long-time accuracy of the new Westinghouse meter is possible because the meter has mechanical, electrical and magnetic stability. These components are among those that contribute to stability:

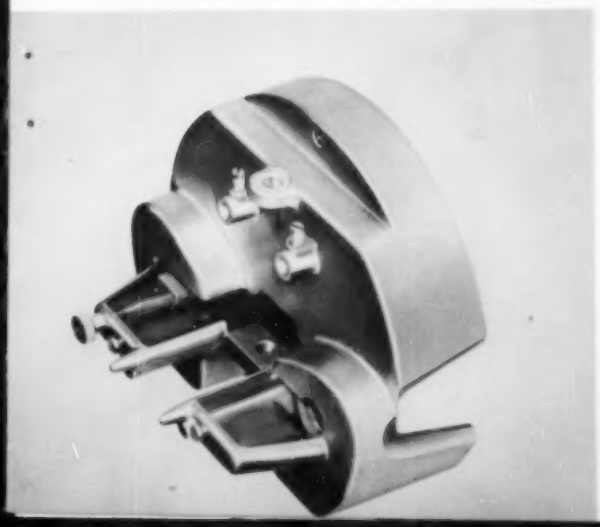
FLEXIBLE UPPER GUIDE BEARING of hardened chrome steel fits into a non-lubricated, removable bronze bearing in the shaft.

BALL AND JEWEL BEARING, pioneered by Westinghouse in 1902, is the only time-proved life-time bearing. It gives lowest friction and longest life. Utility records show that this bearing is practically indestructible.

DIE-CAST ALUMINUM FRAME is thicker and more rigid. The bearing and register mounts are precision-machined, eliminating adjustments in the disk and bearing assembly and in register mesh. Heavy disk guards have been made a part of the frame to prevent disk damage when the meter is laid on its face.

DAMPING MAGNETS made of Alnico are mounted in the aluminum frame, on each side of the disk. To test their resistance to demagnetization by lightning, meters were exposed to surges up to 40,000 amperes, 20 x 50 microsecond wave and showed no change in magnetic strength.





To learn about the corrosion resistance of the Lifetime meter, ***TURN THE PAGE***

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Corrosion-proof design to reduce maintenance costs

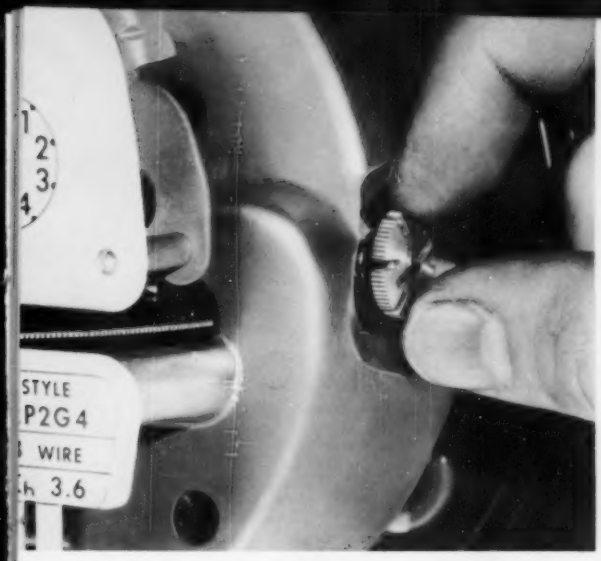
The Lifetime meter represents a close approach to a truly corrosion-proof design. Every component is built to resist corrosion.

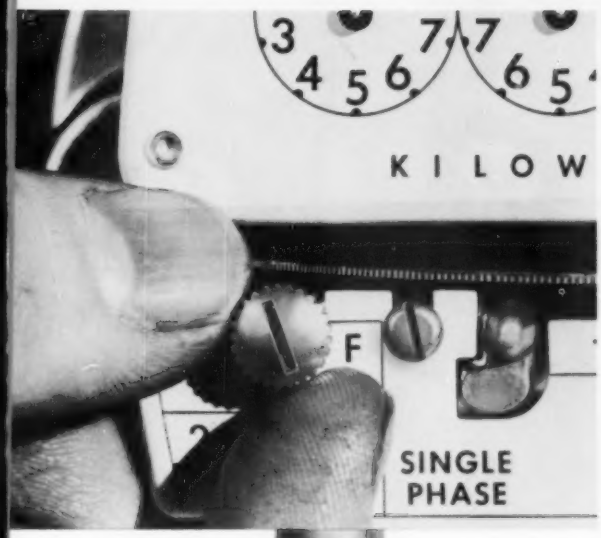
EASY TO READ REGISTER with large numbers on a permanently white dial. Gold finished gears and iridited-aluminum plates in the register resist corrosion.

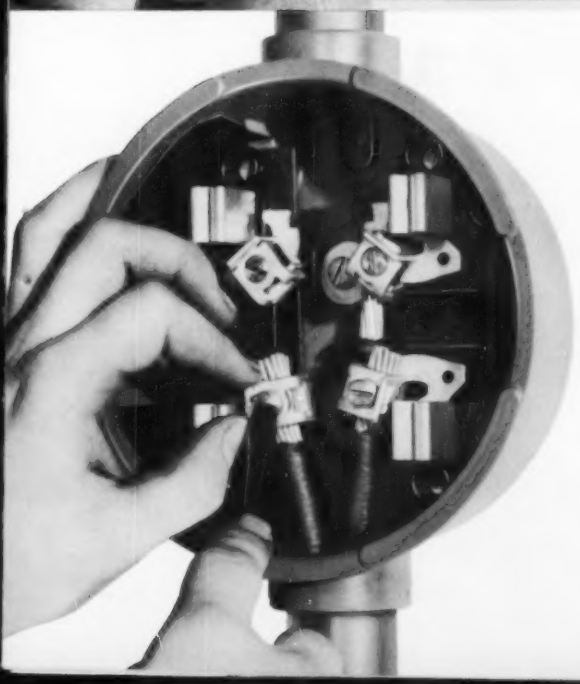
SEPARATE NAMEPLATE provides large serial numbers which are always visible. Gives you an unusually large space for tag or strip-type company identification.

BASES won't corrode. One-piece Moldarta® base for DS meter has high impact strength and extra-strong angles. Koroseal gasket will not dry out, stretch, or shrink. The DA meter has a die-cast aluminum base and the rim on the glass cover is iridited aluminum.

LAMINATIONS for the electromagnet are made of special high-grade steel that is Bonderized to insulate individual laminations, prevent corrosion and afford protection against any changes in flux pattern. The laminations are riveted together at 10 points, insuring a permanent, solid stack—a factor in long-time stable accuracy.







The *Lifetime* meter is easier to adjust

LIGHT LOAD ADJUSTER is spring loaded, can be operated by hand or screw driver from front or side. Adjustment is linear, 1% per turn, ±10% range. Adjuster is on right side of meter.

FULL LOAD ADJUSTER is also spring loaded, can be operated by hand or screw driver. It is located on left front of meter. This adjustment is linear, 1% per turn, ±10% range.

The wide range of adjustment for both light and full load adjusters assures interchangeability of electromagnets.

New high-capacity meter socket reduces installation time

The new line of Westinghouse die-cast aluminum meter sockets has more wiring space, larger and better bus-type terminals for greater ease of wiring with large conductors. Hubs have been moved to the outside to provide more space for wiring. The socket is available in three hub sizes, 1 inch, 1¼ inches and 1½ inches.

For maximum corrosion protection, the sockets are die cast of an aluminum-silicon alloy, iridited and finished with two coats of organic lacquer. A new iridited-aluminum sealing ring, which can be applied without the use of any tools, is supplied on this socket. One side of the ring has a latching projection which hooks through a slot on the other side of the ring. A ratchet arrangement then allows the ring to be drawn up tight without any tools, a time saver for installers.

For the story of the improved terminal used in this socket, TURN THE PAGE

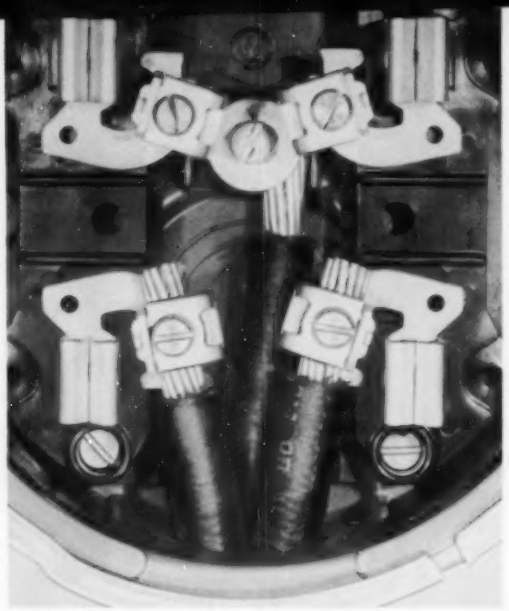
YOU CAN BE **SURE**...IF IT'S

Westinghouse

New high-capacity meter socket *(cont'd)*

The new socket is designed for use with aluminum or copper conductors, up to #0 gauge. The bus-type terminals have a large surface with "follow action", especially important to insure a tight connection on aluminum conductors. The terminals swivel in an arc to facilitate alignment with the conductors. Installation time is reduced when using large conductors. The installer merely takes tops off terminals, lays conductors in place, replaces tops, and tightens terminals. On smaller wire sizes, it is not necessary to take the tops off the terminals—the conductors can be easily pushed into place.

Where three-point mounting is required, an extra mounting hole can be made available by knocking out a thin breakout in the back of the socket. Sockets are available with 2 or 3 hubs and for single-phase and polyphase service.



Tops of terminals are removable so that large conductors can be put into place without bending.

and . . . a completely new plant to provide you with the latest in metering equipment

The Westinghouse Lifetime meter and the new line of meter sockets are now in production at our new 12 million dollar meter plant in Raleigh, N. C. This modern new plant has one-half million square feet of manufacturing space.

All the manufacturing facilities are modern and especially designed to provide you with the latest metering equipment. New methods of manufacturing and quality control are in use to give you the finest metering products.

* * * *

See your Westinghouse Representative for more information on the new Lifetime meter and the new line of sockets, or write to Westinghouse Electric Corporation, 3 Gateway Center, Box 868, Pittsburgh 30, Pa.

CP-1018

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Farm Wiring Handbook

(*Continued from page* 152)

loads. All are explained in easy-to-understand text and diagrams. The interior wiring section covers practically every farm electrical application, from those in dairy and poultry structures to barnyard lighting and water systems. The exterior wiring section contains some all-new chapters on three-phase service, isolated motors, emergency service and underground services and feeders.

The manual is designed for use by agricultural colleges, electric power suppliers, architects, engineers, builders, electrical contractors, and lending institutions as well as the farmer.

To Get Your Copies:

The Committee has authorized Edison Electric Institute to publish the handbook. For copies write: Industry Committee on Interior Wiring Design, Room 2650, 420 Lexington Avenue, New York 17, N Y or contact the headquarters office of any sponsoring organization. Single copies are 50¢; quantity prices will be given on request.

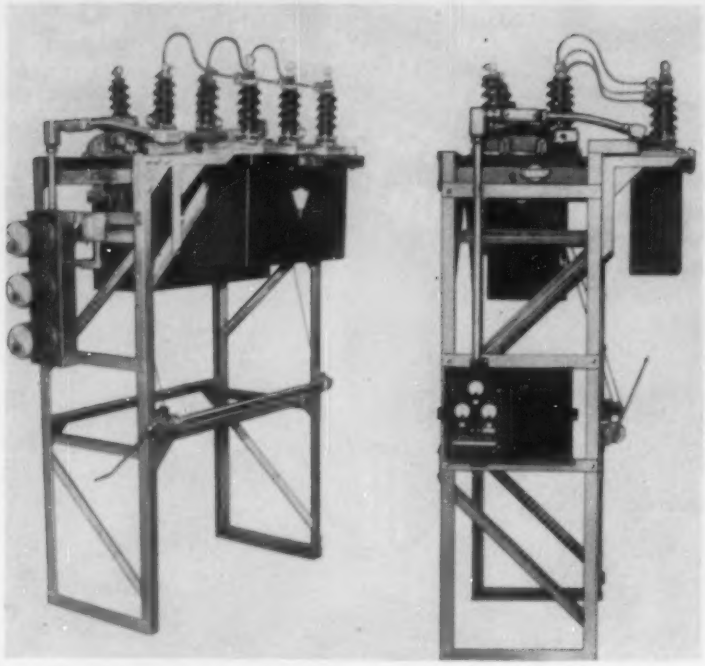
It was developed by experts from the Wiring Design Committee's twelve sponsoring and endorsing organizations. Sponsors include American Home Lighting Institute, Inc, Edison Electric Institute, International Association of Electrical Inspectors, National Association of Electrical Distributors, National Association of Home Builders, National Electrical Contractors Association, National Electrical Manufacturers Association, and National Rural Electric Cooperative Association. Endorsing organizations are American Institute of Electrical Engineers, American Society of Agricultural Engineers, Illuminating Engineering Society, and Inter-Industry Farm Electric Utilization Council.

Extends Wiring Plan

Pennsylvania Power & Light Co's one-year-old wire-on-time plan has been extended indefinitely. Coverage also has been expanded to include any home wiring improvements, and plumbing for water-connected appliances. The customer, however, must agree to install a 100-amp or larger service entrance if his home isn't already so equipped.

CUT MAINTENANCE & LINE CONSTRUCTION TIME IN HALF...
with the
DUAL-PURPOSE
HI-REACH
60' HIGH
with LIFTING CAPACITY
up to 4000 lbs.
Here's something amazingly new in lifts — the Dual-Purpose HI-REACH. This exclusive feature permits its use as an aerial working platform or derrick. It will actually save time and money on any job.
The versatility and ease of maneuverability of the HI-REACH makes it an ideal unit for every kind of aerial maintenance work. It is particularly adaptable for armor rodding and dead ending in line construction. Many years of continuous field use and testing under all conditions have proven the Dual-Purpose HI-REACH will do the work of two or more costly vehicles in less time and with far greater economy. Built with a safety factor of five to give you the best telescopic life available on the market today.
WRITE TODAY FOR ILLUSTRATED BROCHURE
It will be a pleasure to show you the many features that will give you tremendous savings when you use the Dual-Purpose HI-REACH.
Elliott
MANUFACTURING CO.
503-7 Redick Tower
Omaha, Nebraska

NEW EQUIPMENT



Metering Devices

Current metering devices are being offered with Kyle Type R reclosers and TR transformers to provide accurate information for system planning, says the manufacturer.

Two types of metering devices are offered. A conventional meter which indicates an instantaneous value of current in each phase and a thermal ampere-demand meter which indicates average load and maximum current for each phase.

Instantaneous meters are housed in a weatherproof steel cabinet. The meter trough of the thermal device is a standard, rain-tight unit arranged for mounting three meters in a vertical manner. Both can be mounted either on the recloser frame or on nearby structures.

Line Material Co, Milwaukee 1, Wisc.

Cable Clamp

Design of this connector is reported to permit enough pressure to be applied for an electrical connection without flattening or deforming the conductor. Arcing is prevented by a coil spring which maintains contact on the main conductor even when the bolt is loosened three full turns. Clamps can be installed with hot line sticks.

Connectors are available with components of various materials for connecting aluminum or ACSR (main) to aluminum or ACSR, or to copper or Copperweld, and copper or Copperweld (main) to copper.

The first combination has aluminum alloy top and bottom plates and center spacer. It is offered in 10 sizes covering a conductor range from No. 4 to 900 Mcm.

The second combination has the same construction and offers a main conductor range of No. 4 ACSR to 900 Mcm with a tap range from No. 4 copper to 900 Mcm.

The third is made of cast electrical bronze and covers a conductor range from No. 4 to 1,000 Mcm.

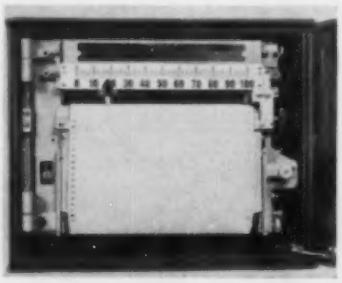
Lamb Corp, Rm 515 Peoples Bank Bldg, Tyler, Texas.

Electronic Recorder

This high-speed electronic recorder for logging any changing variable requires only a quarter-second for its pen to cover the full 11-in. chart width. It is designed for charting variables measured by d-c output transducers.

Accelerated chart speeds are available. Basic options are 2 ips or 4 ipm. It can also be equipped with a chart drive step-up mechanism. This gives a speed of 6 in. per hr which can be increased in a ratio of 30 to 1 or 60 to 1.

Minneapolis-Honeywell Regulator Co, Industrial Div, Philadelphia, Pa.



(*More New Equipment on page* 164)

In the selection of strand for your guys and messengers, consider all the factors and you'll realize the true economy of Copperweld* Strand. It's the only strand that provides both the strength of steel and the corrosion resistance of copper. That means you'll have safe, strong, low-cost support for the entire life of your lines. You can forget about repair and replacement costs because once Copperweld Strand is up, it's up to stay. Try it on your next job. It pays!

*Trade Mark

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION
Glassport, Pa.
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

Copperweld TRADE MARK non-rusting Strand

for GUYS AND MESSENGERS

full 90° bend with one stroke of the ram . . . easy portability . . . extra versatility

Here's the kind of real portability you've been looking for in a bender for ½" to 2" pipe and conduit. Using light, but strong, aluminum alloy for many parts, the new GREENLEE No. 880 Hydraulic Bender is unusually *lightweight*, yet extra rugged, fast, powerful . . . produces 15 tons of ram force! One man can easily carry and operate it to quickly make uniform bends. Complete 90° bends can be made with one ram stroke. Separate two-speed hydraulic hand pump and bending ram simplify handling and setup. Easily operated by hand or may be teamed with a GREENLEE Power Pump for fast production jobs. Attachments also available for bending thin-wall conduit, tubing, bus-bars. Get complete details on how to speed jobs and get better results with the new GREENLEE No. 880 Bender. Write for Bulletin E-217.

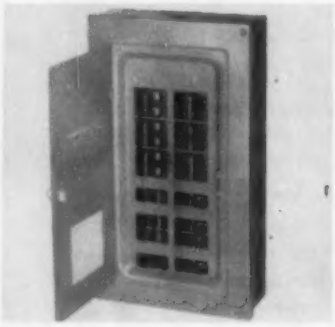
GREENLEE

GREENLEE TOOL CO.
1810 Columbia Ave., Rockford, Illinois

Transformer Paint

Coastal Finish paint is now available in three convenient spray cans—one for each of the three coats that make up the complete finish. The cans are designed to facilitate touching-up transformers when either pole-mounted or on the ground. The finish coat is standard ASA No. 24 gray. Cans are hermetically sealed and can be stored for years under the proper conditions, reports the manufacturer.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.



Load Center

Circuit breaker load center for residential service entrance has 20 circuits arranged in a split-bus interior design and is equipped with 100 amp main lugs.

The service section contains five double-pole branches for 240-v service. A sixth double-pole branch feeds eight more single poles in the split section of the bus to provide 120-v circuits. It will accommodate Type TQL two-pole common trip breakers and Type R single pole breakers.

General Electric Co, Trumbull Components Dept, Plainville, Conn.

Chain Hoists

Use of compound levers instead of gears in these hoists is reported to provide more efficient, more compact, safer and lighter weight units.

Model L-1-½ (left) is a single chain with a standard lift of 56½ in., minimum distance of 14 in. between hooks, and requires a lever pull of 60½ lb to lift 1½ ton loads. The double chain LD-3 has a standard lift of 57 in., minimum distance of 18½ in. between hooks, and takes a lever pull of 62 lb to lift 3 ton loads.

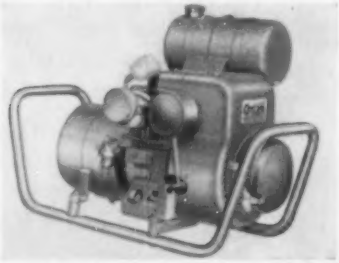
Hoists are made of either malleable iron or aluminum alloy.

Coffing Hoist Div, Duff-Norton Co, Danville, Ill.

Portable Generator

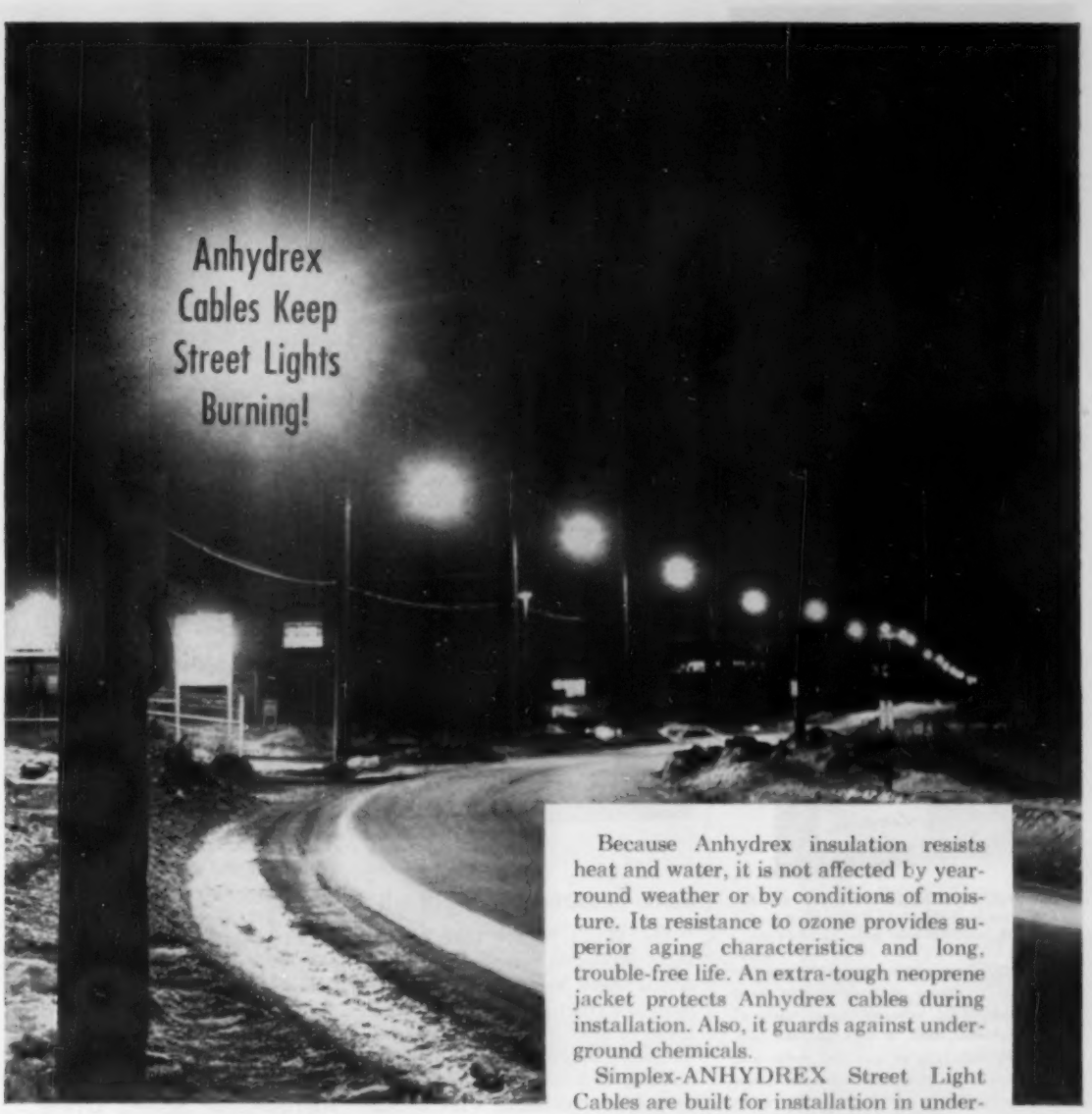
The Model 105AK is a lightweight 1,500-w, 60-cps generating unit. It is driven by a direct-connected 4-cycle, heavy-duty, air-cooled gasoline engine.

These units are offered in two versions: Model 105AK-1P, weighing 125 lb and equipped with a tubular aluminum carrying frame; and Model 105AK-1M, weighing 130 lb, for stationary service.



D. W. Onan & Sons, Inc, Minneapolis 14, Minn.

(*More New Equipment on page* 166)



Because Anhydrex insulation resists heat and water, it is not affected by year-round weather or by conditions of moisture. Its resistance to ozone provides superior aging characteristics and long, trouble-free life. An extra-tough neoprene jacket protects Anhydrex cables during installation. Also, it guards against underground chemicals.

Simplex-ANHYDREX Street Light Cables are built for installation in underground conduits, for burial directly in the earth, or as aerial cables supported by a suitable messenger.

Their simple construction means faster splicing and connecting at terminals. Compared to lead-covered cables, the lighter Anhydrex Cables are easier to handle.

These cables meet all specifications and requirements of I.M.S.A., I.P.C.E.A., and A.S.T.M.

If you have problems connected with the wiring of street lights, write to the address below. No obligation, of course.

Simplex

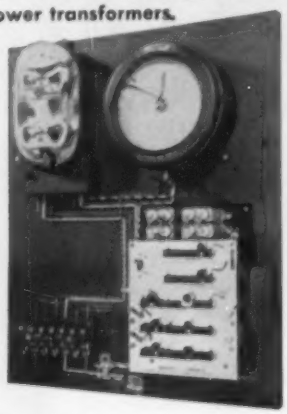
STREET LIGHT CABLES

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Transformer Loss Compensator

Saves you Money!

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.



This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.

Some of the Users . . .

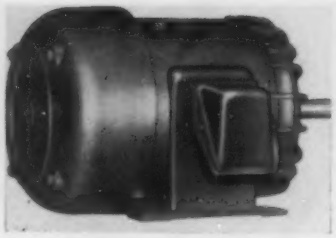
Phila. Electric Co. Penna. Power & Light Co. Texas Power & Light Co. U. S. Bureau of Recl. Public Service Co. of New Hampshire. Utah Power & Light Co. Northern States Power Co.

Get your book now FREE

Detailed information on operation, installation, applications. Write for Bulletin NO. 63-A.

EASTERN SPECIALTY CO.

PHILADELPHIA 40, PA.

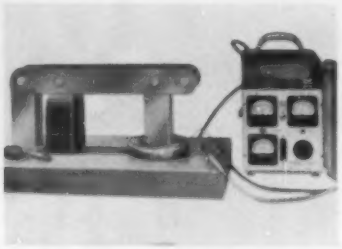


TEFC Motors

Rerated totally enclosed fan cooled motors are being offered in 1 to 5-hp ratings.

In addition to meeting all NEMA requirements, these motors feature an aluminum rotor, "Six Layer Insulation" for stator windings and mechanical modifications to facilitate bolting the motor to the machine or visa versa.

Century Electric Co, 1806 Pine St, St. Louis, Mo.



Coil Tester

The Model 55 coil tester detects short circuits on one or more turns, detects opens and shows number of turns in a coil from 10 to over 3,000. It can be used to test field coils, armature coils, transformer coils and solenoids up to 6-in. high. Minimum coil opening accommodated is 2⅝ by 3 in. or 3⅞-in. diam.

Martindale Electric Co, 1371 Hird Ave, Cleveland 7, Ohio.

Glass Strain Insulators

Fiberglass strain insulators are said to have high impact strength, stand up well under torsional loads and have exceptional weathering characteristics. These strains are reported to remain virtually the same as a rod gap under all conditions either wet or dry, thus eliminating the need for arcing horns.

End fittings are cast malleable iron. The entire assembly is said to have the strength of steel and yet is able to resist shock loads because of the resilient characteristic of glass.

The units are offered in 34⅝, 54 and 78 in. lengths. A No. 703 series has a minimum breaking strength of 18,000 lb and the 800 series, 25,000 lb. Write for four-page descriptive bulletin.

Empire Metal Products Co, 5443 W. Roosevelt Rd, Chicago 50, Ill.

Cable Molding Kit

A 110-v, portable molding kit is reported to permit connections to be made on water-proof, neoprene-insulated heavy duty cable in the field. The kit is said to permanently seal metal connectors and electrical cables in neoprene rubber sleeves. When connectors and sleeves are inter-locked the connection is completely waterproof, yet may be instantly disconnected. Details are given in Catalog No. 131.

Industriline, Inc, Box 98, Cincinnati 36, Ohio.

Adjustable Speed Drive

This adjustable speed drive can be coupled or belted to motors to provide a speed control of ±2% for fans, centrifugal pumps and compressors. It is also designed to handle constant torque loads such as mills, conveyors, machine tools and other applications.

The system consists of an "Ampli-Speed" drive installed between the motor and the load, a wall-mounted magnetic amplifier speed control and a remote control rheostat. Speed can be changed by turning the control rheostat knob or by means of automatic control devices such as combustion pressure or liquid level controls.

For fan type loads, the drives are

(*Continued on page* 170)

Now...TAKE AC POWER ANYWHERE A VEHICLE CAN GO!

MO-BIL-AC* (mobile a-c power supply) driven by vehicle engine, supplies up to 10 KW at 110-220 volts . . . . takes little space

Designed by Star-Kimble to meet the need for a compact, portable source of AC at commercial voltage and frequency, MO-BIL-AC drives a-c powered tools, pumps, compressors, hoists and similar equipment in the field . . . *wherever a self-propelled vehicle can go.*

An outstanding feature of MO-BIL-AC is its low size-weight to power output ratio. To achieve it, a 2-pole alternator is excited by a compact, lightweight regulator with a selenium rectifier and magnetic amplifier working off the alternator output.

This unique S-K development also insures excellent transient response: upon application of full load, voltage recovers in one second or less. Speed of prime mover is not critical because regulator keeps output voltage proportional to output frequency. Thus, standard motors may be operated over a wide frequency range without overheating.

MO-BIL-AC is available in 3, 5 and 10 KW ratings, 60 cps, single and polyphase, any commercial voltage.

Write or phone for full descriptive literature.

*Trade Mark applied for

Star-Kimble MOTOR DIVISION
MIEHLE PRINTING PRESS & MFG. CO.
203 Bloomfield Avenue, Bloomfield, New Jersey
Bloomfield 2-8160

They're cutting the cost of superhighway

- Their light weight cuts installation costs
- They require no initial or maintenance painting
- They have high visibility for maximum safety
- There's a complete absence of seams and joints
- They're spun from aluminum alloy, heat treated for maximum structural strength
- They're designed to fit your individual requirements

One of the keys to safer superhighways is better lighting. And for every phase of turnpike lighting there's a HAPCO Standard to fit the job. HAPCO Poles are sturdy enough for the heaviest duty, yet maintain harmonious beauty with their surroundings. They retain a silver gray beauty, resistant to virtually all atmospheric conditions. Their long life without maintenance makes the investment in HAPCO Poles pay off in the long run.

Be sure to call your Hubbard representative for assistance in specifying street lighting standards, traffic signal pedestals, flood lighting standards, and related equipment. You can order Hubbard products through more than 200 leading electrical distributors throughout the United States.

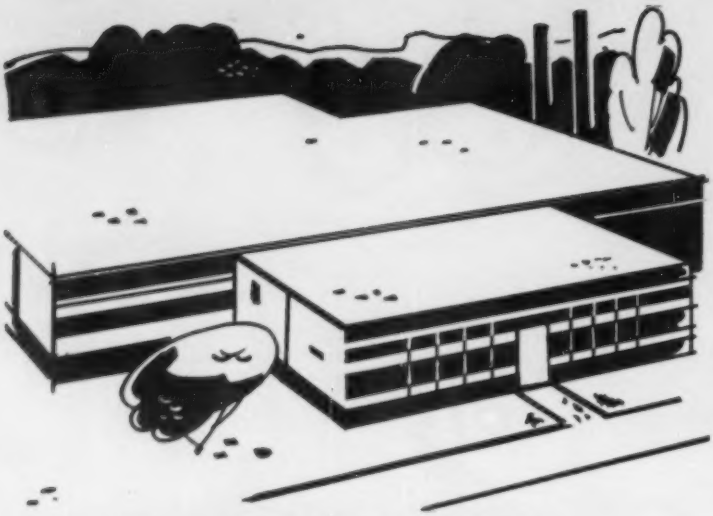
lighting with HAPCO Aluminum Standards

FREE HAPCO CATALOG. If you'd like more details on design features and specifications of the complete HAPCO line, write for this new free catalog. It contains valuable information to help you plan the most efficient, most beautiful highway and street lighting, as well as any other outdoor lighting requirement. Hubbard Aluminum Products Company, 6301 Butler Street, Pittsburgh 1, Pa.

HUBBARD ALUMINUM PRODUCTS COMPANY

Division of Hubbard & Company

Pittsburgh 1, Pa.



CONTINENTAL AVA

The Safety Factor in Factory Expansion

One of the highest rated temperature cables made, Continental AVA adds important safety and savings to your plans —whether it's an entirely new distribution or necessary changes in an existing wiring system. Ideal for open or in conduit installation where the need exists for **high current carrying capacities** and resistance to **high temperature**, oil, grease, corrosive vapors or moisture. Available in a wide range of sizes from 18 AWG to 2,000,000 CM, 600 to 5000 volts.

CONTINENTAL TYPE AVA—3000 volt service

Available sizes 14 AWG—2,000,000 CM inclusive.

Stranded copper conductor protected by five layers of insulating material—felted asbestos, varnished cambric, cellophane separator, asbestos insulation and asbestos braid. **For your wiring needs.** Continental's industrial wire and cable specialists are available to serve you at any time. Write for complete catalog.

Contact: Continental Sales, Box 363, Dept. CWS-2
Wallingford, Conn., Phone COlony 9-7718

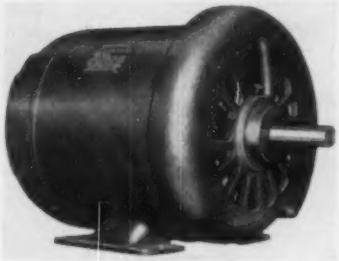
Continental
WIRE CORPORATION

WALLINGFORD, CONNECTICUT • YORK, PENNSYLVANIA

New Equipment

(*Continued from page* 166)

available in ratings up to 95 hp. For constant torque loads, the ratings range up to 75 hp. Drives are designed for use with motor speeds of 870, 1150 or 1750 rpm. Details are given in Bulletin 4400-PRD-229.
Electric Machinery Mfg Co, Minneapolis 13, Minn.



Fan Cooled Motor

This ½-hp totally enclosed fan cooled motor is recommended for dirty, dusty, fume or mist-laden atmospheres. It is reported to meet all NEMA requirements in addition to having an aluminum rotor and "Six Layer Insulation" stator winding.
Century Electric Co, 1806 Pine St, St. Louis, Mo.

Corrosion Meter

The Hayward Model 610 Dual Sensitivity voltmeter is an instrument for measuring structure-to-soil potential in corrosion control and cathodic protection work.

Model 610 consists of a special voltmeter movement with two different sensitivities. Voltage ranges of 0-0.2/1/2/10/20/100 v dc are pro-

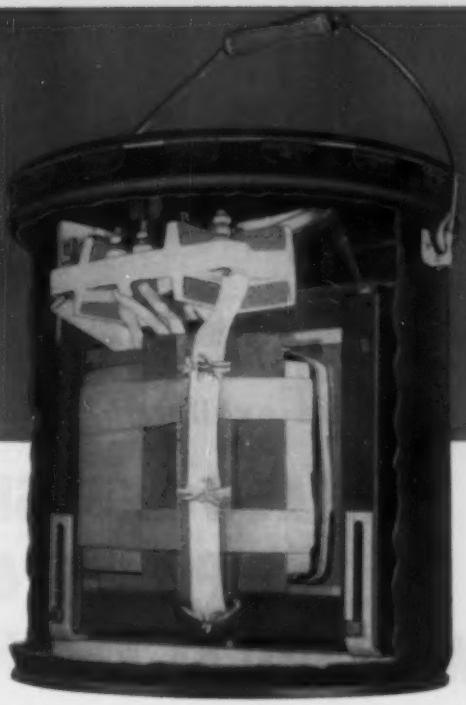
(*Continued on page* 172)

Here's how to

Renew burned-out Transformers—

Quickly, Easily, Inexpensively

Wagner Replacement Core and Coil Assemblies come to you *Ready to Install* — without testing or drying — packaged in transformer oil for complete protection



Wagner packaged transformer core and coil assemblies are brand new elements, exactly like those used in new Wagner Transformers. They are made with preformed cores of cold-rolled oriented-grain steel (Wagner Form W Construction) which are considerably smaller than the old hot-rolled silicon steel cores. This means that in many cases you can up-rate as well as renew your old or burned-out transformers. They are available in ratings from 3 through 167 kva.

These replacement elements come ready for use—fully dried and tested—protected in a sealed container filled with Wagner 7-NI inhibited transformer oil, which you may also use in your tank.

Installation is easy... the assemblies are complete with terminal board or tap changer, with leads ready to install in your tank. Each assembly has a new serial number and name plate.

Wagner Bushing Assemblies

High Voltage Bushing Assembly

Available in cover-mounted or tank wall mounted types to meet a wide range of requirements. Gasket, solderless connector-type terminal and clamping devices are included—fuses can be furnished when specified.

Low Voltage Bushing Assembly

Ready to install—includes porcelain bushing, gasket, solderless connector-type terminal and clamping device.

Field Repair Service for Substation Transformers

Wagner's Transformer Service Trucks—completely equipped for field repairs—each with the services of an expert—are available on schedule in most localities. The cost of this exclusive Wagner service is nominal—write for information.

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

Wagner Electric Corporation EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS • AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

TS 53-1

SEE *exhibits like this . . . at the*

CHICAGO EXPOSITION OF POWER & MECHANICAL ENGINEERING

WHERE? . . . Only minutes away from the ASME Meetings at Chicago's COLISEUM . . . one floor with information-packed exhibits—a minimum of walking to get a maximum of facts, helpful tips—a complete picture of Power and Mechanical Engineering TODAY!

WHEN? . . . November 14-18, 1955

WHY? . . . This special show is in conjunction with the 75TH ANNIVERSITY MEETING OF THE ASME. The significant theme of these sessions is "THE ENGINEER AND THE WORLD OF COMMERCE AND INDUSTRY." Subjects of vital importance to *your* field of interest will be covered. At the EXPOSITION, you'll *see* the newest, most advanced power equipment . . . manufacturers' exhibits that will show hundreds of new techniques to improve productivity and economy, and to utilize all types of power more effectively.

Plan now to attend the

CHICAGO EXPOSITION OF POWER & MECHANICAL ENGINEERING

(Under the auspices of the ASME, and in conjunction with its 75TH ANNIVERSARY Meeting)

For advance registration, write The Management:

INTERNATIONAL EXPOSITION COMPANY

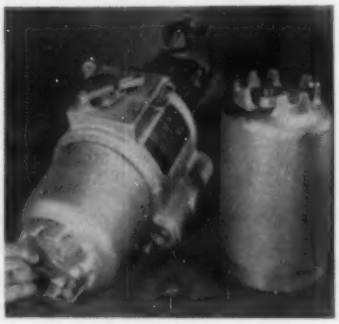
480 Lexington Avenue New York 17, N. Y.

New Equipment

(*Continued from page* 170)

vided. No tubes or batteries are required. To operate, the instrument is connected to the source of voltage, proper polarity selected and a reading obtained. A second button is then depressed and a second reading obtained. If both readings are identical, the value read is the true open circuit voltage. Details are given in Bulletin 1-3.

Associated Research, Inc, 3760 W. Belmont Ave, Chicago 18, Ill.



Enclosure Breather

The stainless steel universal breather and drain shown above (at pencil point) is said to allow the passage of three to four times more volume of air than standard types.

Type ECD devices are for use on explosion-proof combination starters and circuit breakers (illustrated) and other equipment housings in Class 1, Groups C and D hazardous locations. They can be installed by screwing them into hubs or holes tapped for conduit having five or more threads.

Crouse-Hinds Co, Wolf & Seventh North Sts, Syracuse, N. Y.

(*More New Products on page* 174)

Phelps Dodge can make any Lead Sheath you specify!

No one type is best for all jobs!

Choosing the right lead sheath is strictly a matter of sizing up your specific job. No single type of sheath answers *all* the power cable needs of modern electric utilities.

Phelps Dodge has a wide background of practical experience in developing, testing and manufacturing lead alloys for power cable sheaths. This covers the entire range of lead alloys, including copper bearing or common lead, Habirloy (arsenical) lead or tellurium alloy lead.

Phelps Dodge makes or can make any lead sheath you want. Next time you're looking for a sheath to fit a specific application, consult Phelps Dodge.

PHELPS DODGE COPPER PRODUCTS CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

Unusual 138-KV oil-filled cable designed for Commonwealth Edison Company of Chicago. One of many Phelps Dodge cable designs with a Habirloy (arsenical) lead sheath.

acker

utility digger sets poles in minutes!

The new Acker Utility Digger makes short work of pole setting. Its lightweight, compact design performs perfectly in rugged open country or crowded city streets. The basic unit mounts on jeep or small truck with either self-contained or power take-off.

LOOK at some of the exclusive features of this moderately priced digger.

1. Built-in power hoist and sheave have a capacity of 1500 lbs.
2. High speed auger digs holes up to 20" in diameter and depths of 10 feet.
3. Completely self-contained unit with no extra accessories to buy.
4. Finger-tip hydraulic controls for easy, one man operation.
5. Speedy operation saves time and money.

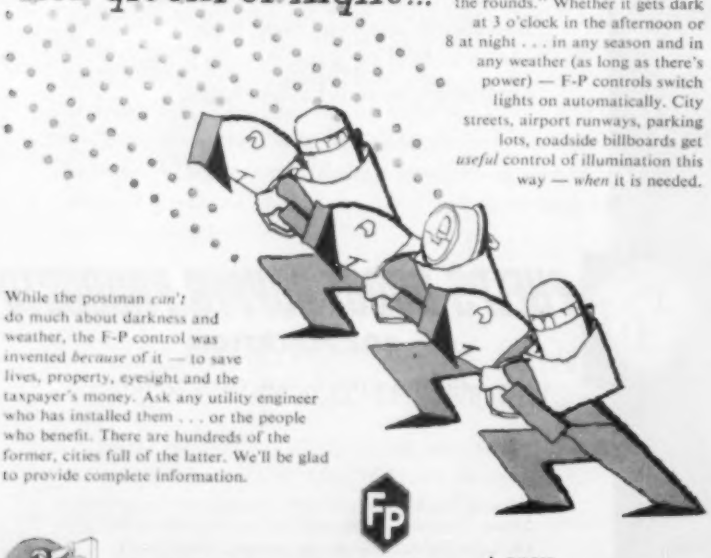
For complete details, write for bulletin **40EW.**

ACKER DRILL CO., INC. 725 W. Lackawanna Avenue · Scranton, Penna.

a complete line of Soil Sampling Tools, Diamond and Shot Core Drills, Drilling Accessories and Equipment

neither snow nor rain, nor heat nor gloom of night...

. . . can keep the dependable postman — or a Fisher-Pierce photoelectric lighting control — from "completing the rounds." Whether it gets dark at 3 o'clock in the afternoon or 8 at night . . . in any season and in any weather (as long as there's power) — F-P controls switch lights on automatically. City streets, airport runways, parking lots, roadside billboards get *useful* control of illumination this way — *when* it is needed.



While the postman *can't* do much about darkness and weather, the F-P control was invented *because* of it — to save lives, property, eyesight and the taxpayer's money. Ask any utility engineer who has installed them . . . or the people who benefit. There are hundreds of the former, cities full of the latter. We'll be glad to provide complete information.

THE FISHER-PIERCE COMPANY, INC.
82 Pearl Street, So. Braintree, Boston 85, Mass.

EXPORT:
Philips Export Corp., 100 E. 42nd Street, New York 17, N. Y.
In Canada:
Northern Electric Co., Ltd.

MORE NEW PRODUCTS

Mathias Klein & Sons, 7200 McCormick Rd, Chicago 45, Ill., has: A **knife tool** designed to cut the strands of ACSR up to and including No. 2. An all Nylon **safety strap** which features low electrical conductivity.

Power-Strut, Inc, 11 Claflin St, Framingham, Mass., offers a continuous slot **metal framing** for racking conduit and cable, hanging lighting fixtures and supporting busbars. The basic channel is 12 gauge steel available in various finishes.

Day-Brite Lighting, Inc, 5411 Bulwer Ave, St. Louis, Mo., offers the Ranger series of **fluorescent fixtures** featuring push-type spring-loaded sockets which are metal clad to insure positive lamp alignment and secure lamp support. They are available in 4 and 8-ft sizes for two or four lamps.

Lord Mfg Co, 1635 W. 12th St, Erie, Pa., has bonded-rubber lattice **equipment mountings** designed to reduce noise and vibration. Capacities range from 250 to 3,000 lb.

Westinghouse Electric Corp, Box 2099 Pittsburgh 30, Pa., is making an all-purpose single-phase **ac/dc welder** which operates on 230-v. It provides ac welding currents of 25 to 250 amp and dc currents from 20 to 200 amp.

Mall Tool Co, 7725 S. Chicago Ave, Chicago 19, Ill., reports production of an electric **metal shears** for cutting steel up to 16 gauge.

Electric Regulator Corp, 314 Pearl St, Norwalk, Conn., has a line of **voltage-frequency controls** for motor-generator sets and inverters. Controls convert any dc control voltage to any ac output voltage within rating of the controlled machine.

Thor Power Tool Co, 175 N. State St, Aurora, Ill., has a **hack saw attachment** for electric or air driven portable power tools.

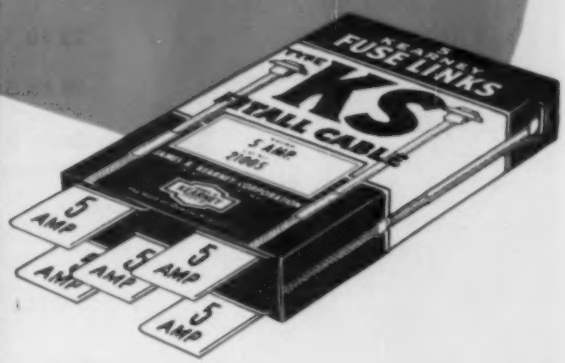
Weston Electrical Instrument Corp, 614 Frelinghuysen Ave, Newark 5, N. J., has a high sensitivity bimetal actuated miniature **recorder** for use in cold locations such as cold storage rooms and refrigerators.

Each Outage is one too many!

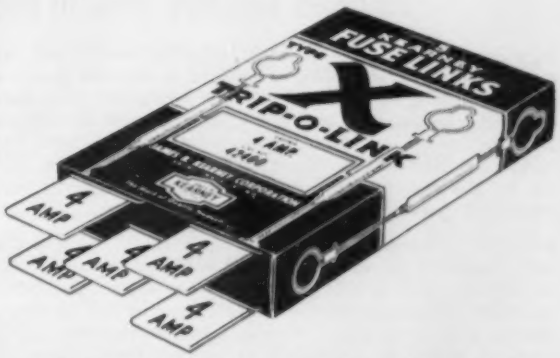
These closely co-ordinated KEARNEY FUSE LINKS prevent unnecessary blowing

For a smooth functioning, customer pleasing system, you may need more than just "fast" and "slow" fuse links. These Kearney *Specialized* links have precision matched time-current characteristics to prevent unnecessary interruptions . . . and, at the same time, protect your equipment.

ALL KEARNEY FUSE LINKS . . . including EEI-NEMA Standard Types . . . are color-coded to save time and prevent mistakes. They are packaged for easy handling and engineered with the accuracy you need for effective co-ordination. Time-current curves are available to help you work out your coordination.



KEARNEY Type KS . . . specially designed to protect and still keep outages at a minimum on circuits subject to switching and lightning surges.



KEARNEY Type X . . . specially designed to keep transformers in service during overloads and surges . . . yet to protect before the damage range is reached. Opens 230% of rated current load within five minutes.

276

For Better Construction . . . Safer Maintenance

JAMES R. KEARNEY

Specify **KEARNEY PRODUCTS**

The Mark of Quality

JAMES R. KEARNEY CORPORATION • 4234-42 CLAYTON AVENUE, ST. LOUIS 10, MISSOURI • Canadian Plant: GUELPH, ONTARIO

New Bi-Directional Power Monitor

Quickly measures incident or reflected power, simplifies matching loads to lines

New Sierra Model 164 is a compact, versatile, bi-directional monitor for intermittent or continuous measuring of incident or reflected power, or convenient and precise matching of loads to lines. The instrument offers unequalled measuring ease and economy, since only two plug-in elements are required for coverage of all frequencies 25 to 1,000 mc and wattages 10 to 500 watts. Two plug-in elements cover, respectively, 25 to 250 mc and 200 to 1,000 mc. Both have 4 power ranges: 10, 50, 100 and 500 watts. Accuracy is ±5% full scale. No auxiliary power is required to operate the instrument.

Because of its compact size and wide range, Model 164 is ideal for portable applications (mobile, aircraft, etc.) as well as laboratory use. It is supplied in a sturdy carrying case (one or both plug-in elements supplied as ordered) and both meter and directional coupler may be removed from the case for remote monitoring. The monitor may be equipped for most connectors normally employed with 50 ohm lines. A twist of the wrist selects incident or reflected power, or any power range, without requiring removal of power. No exchange of plug-in elements is necessary to read low levels of reflected power.

TENTATIVE SPECIFICATIONS

Power Ranges: 10, 50, 100 and 500 watts full scale direct reading.

Accuracy: ±5% of full scale.

Insertion VSWR: Less than 1.08.

Frequency Ranges: 25 to 1,000 mc. Two plug-in elements.

Low Frequency Element: 25 to 250 mc.

High Frequency Element: 200 to 1,000 mc

Impedance: 50 ohm coaxial line.

Data subject to change without notice.

sierra

Sierra Electronic Corporation
San Carlos 2, California, U. S. A.
Sales representatives in major cities
Manufacturers of Carrier Frequency Voltmeters, Wave Analyzers, Line Fault Analyzers, Directional Couplers, Wideband RF Transformers, Custom Radio Transmitters, VHF-UHF Detectors, Variable Impedance Wattmeters, Reflection Coefficient Meters.

CATALOGS - BULLETINS

● **LINE HARDWARE:** Bulletin DL8A, 43 pages, covers a complete line of strain and suspension hardware. Cable sizes accommodated, weights and dimensions of each item are included. Line Material Co, Milwaukee 1, Wisc.

● **CABLES:** Powerduct cables for flexible bus-drop power distribution are described in 4-page Folder DM 5541. Information and tabular data on Duracord and Densheath type cable, as well as directions for installation with overhead bus-duct are given. Anaconda Wire & Cable Co, 25 Broadway, New York 4, N. Y.

● **SILICONE RUBBER:** A 4-page bulletin (Form No. 9-102) covers Silastic silicone rubber. It contains detailed properties and performance as affected by extreme temperatures, weathering, compression, chemicals and dielectric service. Charts, tables, graphs and application photographs are included. Dow Corning Corp, Midland, Mich.

● **STEEL:** "Buyers Guide to Sheets and Strip" is an 8-page bulletin listing more than 20 different kinds of flat-rolled steel furnished in coils, stock sizes and cut-to-order blanks. Suggestions are given for stock selection and buying to achieve maximum economy. Joseph T. Ryerson & Son, Inc, Box 8000-A, Chicago 80, Ill.

● **SWITCHES:** A complete line of industrial enclosed switches is covered in Catalog No. 83, 28 pages. Included are general purpose switches, sealed switches, heavy-duty limit switches, hand operated switches and maintained-contact switches. Dimensions, circuit diagrams and electrical data are also given. Micro Switch Div, Minneapolis-Honeywell Regulator Co, Freeport, Ill.

● **HYDRAULIC JACKS:** Self-stowing hydraulic support jacks for trucks are covered in a 2-page bulletin. It gives dimensions and performance data and describes how the self-stowing feature operates. J. H. Holan Corp, 4100 W. 150th St, Cleveland 11, Ohio.

● **CABLE TROUGH:** Bulletin 67A, 12 pages, describes and illustrates complete cable trough systems with "built-in" couplers. Dimensions of all sections are given along with load deflection data of various spans. T. J. Cope, Inc, 711 S. 50th St, Philadelphia 43, Pa.

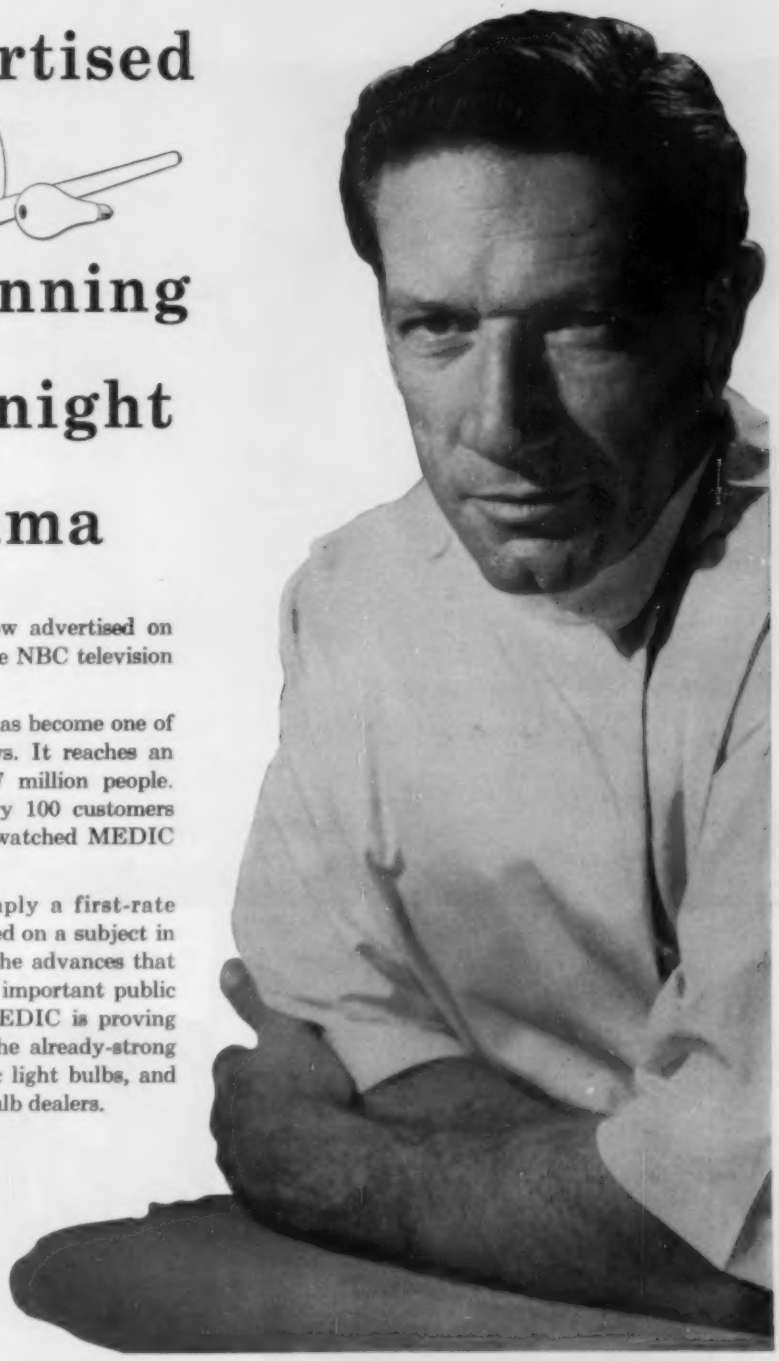
● **ALUMINUM BUS:** The use of aluminum bus bars in both feeder and plug-in or trolley busway distribution systems is described in an 8-page bulletin (GEA-6169). Detailed descriptions are given of construction features, operating characteristics and specifications. General Electric Co, Distribution Assemblies Dept, Plainville, Conn.

● **PIPELINE PROTECTION:** Applications and properties of "Scotch" brand products for pipeline protection are covered in a 16-page booklet. Minnesota Mining & Mfg Co, Dept. E5-229, 900 Fauquier St, St. Paul 6 Minn.

● **CABLE SPLICING:** Step-by-step pictorial instructions for making all types of cable joints on neoprene jacketed Durasheath cables are contained in Booklet DM-5566. Illustrations are supplemented by simple written instructions. Anaconda Wire & Cable Co, 25 Broadway, New York 4, N. Y.

● **JIB CRANE:** A fully revolving jib crane for handling power poles and transformers is described and illustrated in a 4-page bulletin. The bulletin describes installation and gives capacities and advantages of this crane. CraneVeyor Corp, 1240 S. Boyle Ave, Los Angeles 23, Calif.

General Electric lamps now advertised on MEDIC award-winning Monday night TV drama



General Electric lamps are now advertised on MEDIC, over 81 stations of the NBC television network.

In one short year, MEDIC has become one of television's most popular shows. It reaches an average audience of about 17 million people. Chances are that, out of every 100 customers who walk into your store, 44 watched MEDIC last week!

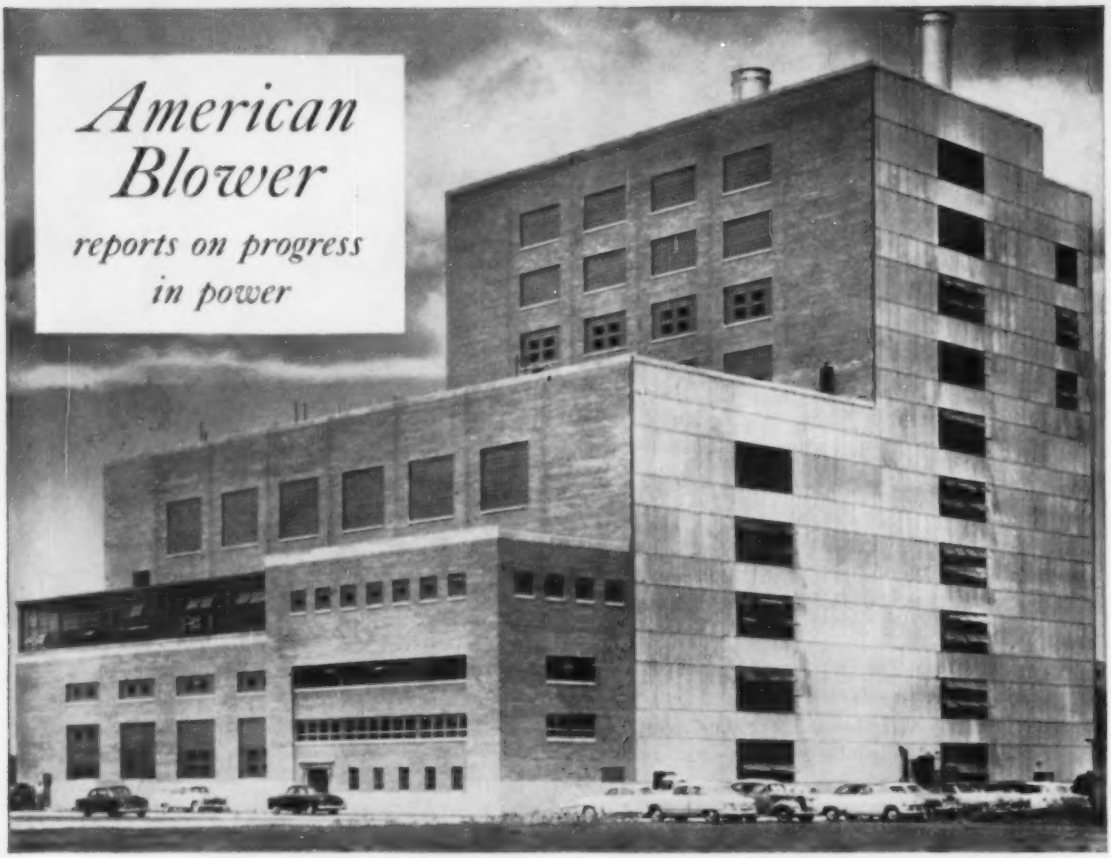
MEDIC is more than simply a first-rate drama. It keeps people informed on a subject in which everyone has a stake—the advances that medical science is making. An important public service! That explains why MEDIC is proving so effective in strengthening the already-strong preference for General Electric light bulbs, and in building good will for G-E bulb dealers.

Tune in MEDIC next Monday night

See one more reason why it pays most to sell General Electric bulbs. Lamp Division, General Electric, Nela Park, Cleveland 12, Ohio.

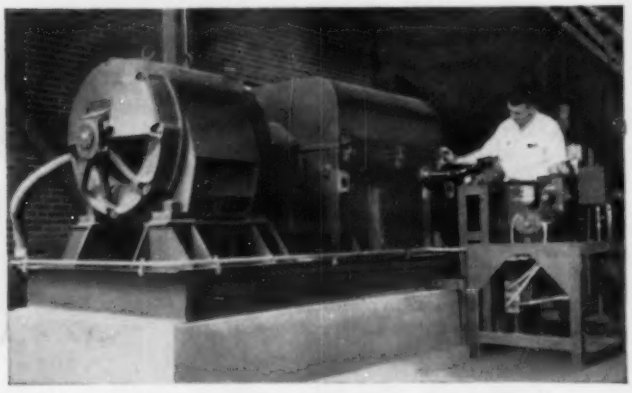
GENERAL ELECTRIC

Iowa Electric Light & Power's kw



Iowa Electric's new Sutherland Station, under construction at Marshalltown, will have two generating units. First unit, with 33,000 kw capacity, was completed in 1955.

American Blower Induced Draft Fans on Sutherland Station's new No. 1 unit are rated @ 97,000 cfm @ 336° F @ 11.75" sp @ 239.0 bhp.



Driving induced draft fan, American Blower Gyrol Fluid Drive – class IV, type VS – provides adjustable speed control; is rated @ 250 hp @ 870 rpm.

sales increase 356% in 17 years!

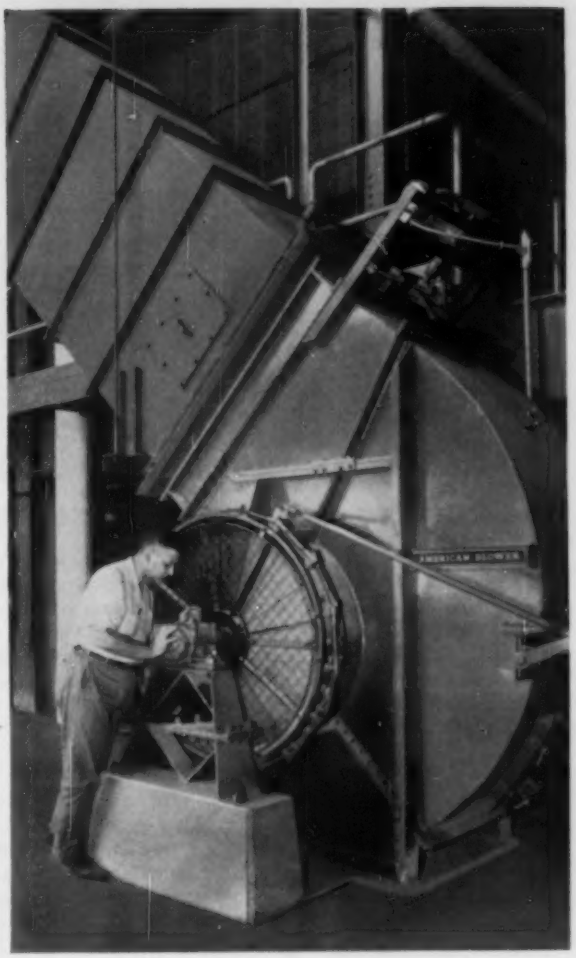
Relying on experience, rapidly expanding utility chooses American Blower air-handling equipment

1936 ushered in a phenomenal growth period for the Iowa Electric Light and Power Company. Fast-rising electrical needs called for new and larger facilities, longer distribution lines. Two mergers extended the company's operations. By 1953, 17 years later, Iowa Electric was serving 51 counties — and kilowatt-hour sales were up 356%! Today, Iowa Electric's facilities are still mushrooming. And the end is nowhere in sight!

Expansion has included new electrical generating units at the Boone and Cedar Rapids Plants . . . where American Blower Forced and Induced Draft Fans, Gyrol Fluid Drives, and a Fly Ash Precipitator were installed. This equipment has proved so dependable and free of maintenance that Iowa Electric again chose American Blower for Sutherland Station, its new plant at Marshalltown, completed in 1955 (first of two units to be constructed).

Experience has led many other progressive, investor-owned utilities to specify American Blower again and again, when expanding or modernizing. "There's no substitute," they report, "for the quality of American Blower Mechanical Draft Fans, Fly Ash Precipitators, Heavy-Duty Steam Coils, and Gyrol Fluid Drives for boiler feed pump and fan control." They rely on American Blower . . . you can too.

American Blower branch offices are conveniently located throughout the U.S. You'll find one of our representatives easy to contact — to discuss *your* problems.



No. 1 unit at Sutherland Station uses American Blower Forced Draft Fans, each with 57,500 cfm capacity @ 120° F @ 11.6" sp @ 138.0 bhp.

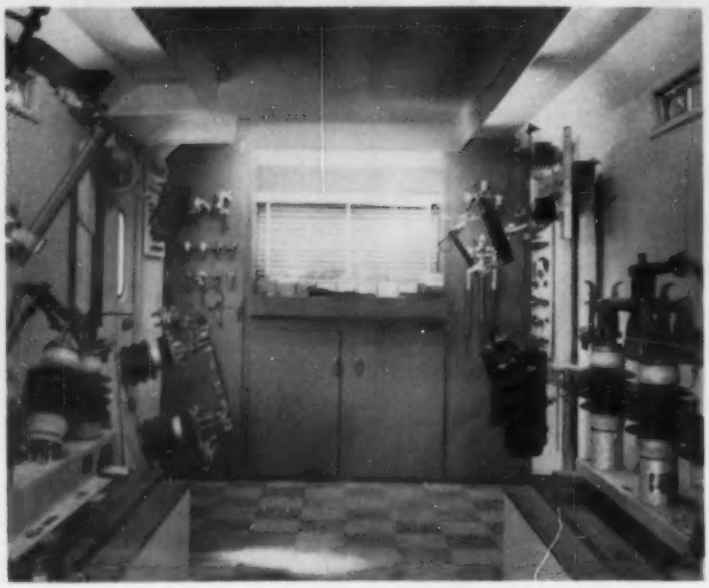
AMERICAN BLOWER CORPORATION
DETROIT 32, MICHIGAN

CANADIAN SIROCCO COMPANY, LTD.
WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

MANUFACTURERS AND MARKETS



Kearney to Display Products via Trailer

The James R. Kearney Corp of St. Louis, Mo., is placing in service a truck-trailer combination for the display and demonstration of its products. The truck is equipped for working demonstrations of live-line maintenance with Hi-Line tools. The air conditioned trailer is arranged for showing hook and group-operated disconnect switches, cutouts and fuse links, lightning arresters, mechanical and compression connectors and other devices. The unit is scheduled to travel about 45,000 miles in 27 states east of the Rocky Mountains. Illustration shows the products displayed in one section of the trailer.

ISA Exhibit Restresses Trend to Automation

Instrument Society of America's exhibit and conference in Los Angeles, Sept. 12-16, underscored again the trend toward automation in all industries, including electric utilities.

Emphasis was strong in the show on electronic data handling equipment, telemetering and other types of remote control systems, and adaptation of various types of read-out instruments to process control.

There was continued evidence of a trend from pneumatic to electronic instrumentation, but at the same time it was apparent that many instrument manufacturers were producing both types and pointing up advantages and limitations of each for specific purposes.

Attendance at the show—estimated at 15,000—was not so heavy as in past shows in the East, but most of the people manning the 327 exhibits were impressed by the quality of the attendance. It was predominantly management personnel with practical rather than academic interest.

Those attending ISA and concurrent AIEE technical sessions heard several papers of interest to the power field, including one on "Instrumentation for Modern Utility Power Plants," by William Welch, Jr, Long Island Lighting Co, and "Accuracy of Standard Power Plant Instrumentation for Heat Rate Testing," by Paul Matthew, Pacific Gas & Electric Co.

De Laval Pacific Moves

De Laval Pacific Co has moved to a new location at 201 E. Millbrae Ave, Millbrae, Calif. The new facilities have enlarged office space, warehousing and machine shop area.

Copperweld Expansion Plans Announced

A $12 million modernization and expansion program has been disclosed by Copperweld Steel Co. It is scheduled for completion in 1957.

The company proposes to finance the program by obtaining approximately $5.5 million from sale of common stock, up to $5.5 million from borrowing on a long term basis, and the balance from retained earnings. According to Frank R. S. Kaplan, president, the increased earnings anticipated from the program should materially benefit the present shareholders after allowing for interest on the additional debt and the increase in the outstanding number of shares of stock to be issued to finance the program.

Approximately $10 million is to be spent at the Steel Division in Warren, Ohio. Melting facilities will be enlarged to seven electric furnaces and a capacity of 660,000 tons of ingots per year. And with additions to other facilities, it is estimated that shipments from this division could be increased about 40%.

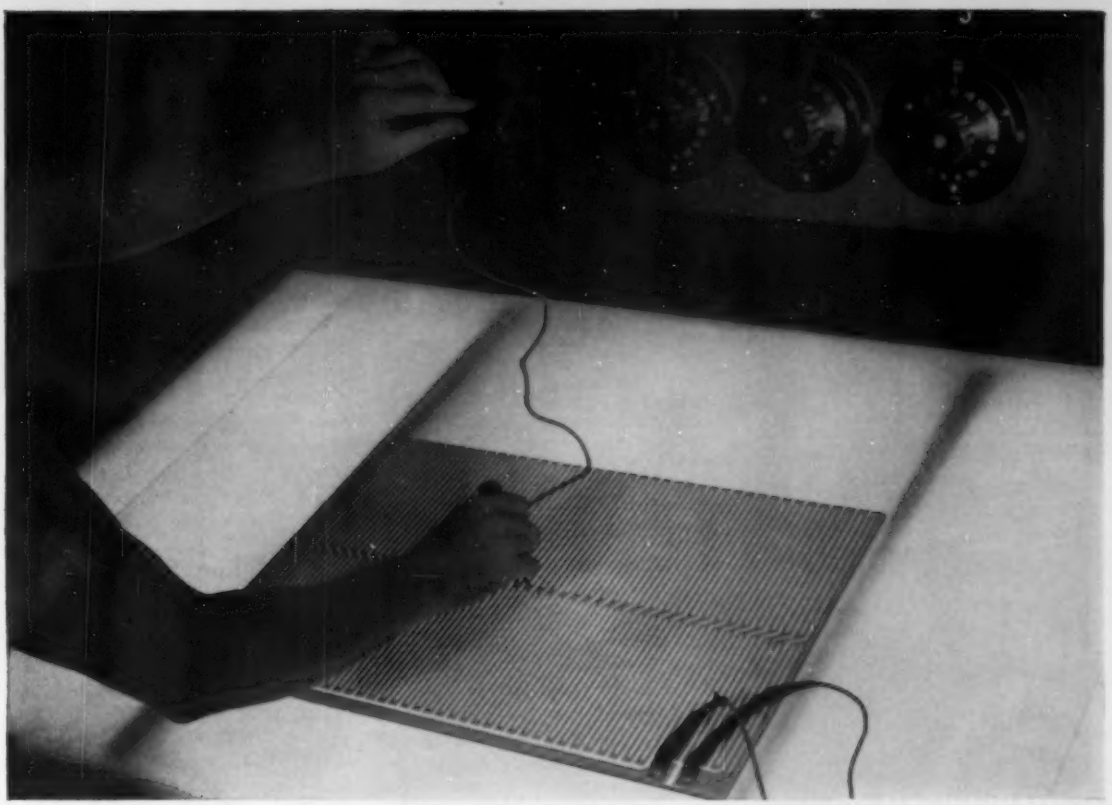
At the Wire and Cable Division at Glassport, Pa., approximately $1 million will be expended for improvements. At this plant, the company makes a wide variety of copper-covered steel wire products.

Close to $1 million is ear-marked for the Ohio Seamless Tube Division at Shelby, Ohio, for auxiliary equipment to provide a wider range of seamless steel tubing products.

U. S. Copper Production

Production of primary copper in the United States, according to the Copper Institute in New York, was 67,635 tons in August, an increase of over 100%, compared to 31,846 tons in July. Refined copper production was 98,732 tons in August but was 51,182 tons in July. Deliveries to fabricators was 90,078 tons in August, an increase of over 50% from 60,143 tons in July 1. Refined stocks amounted to 49,350 tons at the end of August, compared to 36,293 tons at the end of July and 47,108 tons at the end of 1954.

(*More M & M on page* 182)



Time-Tested...and Ready for the BIG PUSH on ELECTRIC HEAT

Electric heat is an exciting new idea to millions of potential customers! As new, as tremendous, as this market is you do not have to take chances and experiment with new, untried materials.

For over 10 years, Blue Ridge has been making RA-GRID Heater Plates for permanent heating units, portable heaters and such convenience products as electric hostess trays. Today, it is estimated that over 600,000 RA-GRID units are in use in homes and industry.

Clean, uniform radiant heat is expected from electric units. But what more do you get with RA-GRID heater plates?

Safety. An outstanding feature of RA-GRID. Fire hazard is reduced by lower maximum temperatures on any part of the plate for a given wattage load. The plate, due to special circuit design, operates at a more uniform temperature over the entire surface.

Faster Heat-Up. RA-GRID plates will reach full operating temperatures in a shorter time than other type heater plates . . . giving you immediate, all-around heat.

Durability. Assured in every RA-GRID because its high temper is consistently controlled . . . giving it greater resistance to thermal shock and impact.

Beauty. The aluminum-backed glass plate blends well with any color plan and gives added sales appeal to your product.

Reliability. Blue Ridge is the only manufacturer who makes the glass and fabricates it into the complete heater plate.

Go after this growing market with units made with RA-GRID plates by Blue Ridge. Write us for further information.

MADE BY **BLUE RIDGE GLASS CORP.**
KINGSPORT, TENNESSEE

BLUE RIDGE GLASS

Rescued from

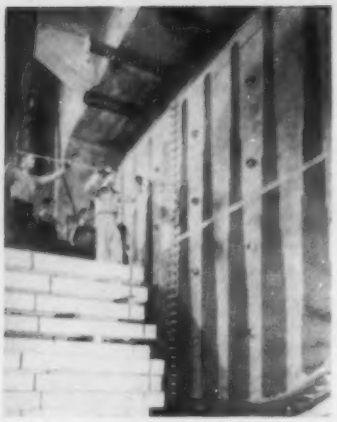
graveyard by

G-E Service Shop

Get your obsolete distribution transformers back on the pole again—as good as new! Just call your local G-E Service Shop. We'll rebuild them ...uprate them 40% or more ...and return them with new-transformer warranties. There are 31 G-E Service Shops throughout the country—one near you. 431-31

Progress Is Our Most Important Product

GENERAL ELECTRIC



A-C Surface Condenser Employs Aluminum Tubes

This new 105,000 sq ft Allis-Chalmers surface condenser is believed to be the first unit of its size to be fitted with aluminum heat exchanger tubes. Here the unit is shown undergoing tubing in the Oak Creek plant of the Wisconsin Electric Power Co.

Use of the aluminum tubes in this condenser was deemed feasible following several years of test in collaboration with Allis-Chalmers engineers.

Westinghouse to Build Generator For NYCTA

The New York City Transit Authority has ordered a 60,000-kw turbine-generator from Westinghouse Electric Corp. The unit costing nearly $2 million, is part of the TA's long range program to revamp and modernize its generating facilities.

The turbine-generator will be installed, early in 1958, at the Authority's 74th Street and East River plant in Manhattan. It will be the second Westinghouse unit to be installed in this plant, which will eventually have four such units.

L-M Produces Movie to Foster Street Lighting

To promote better street lighting, Line Material Co has just finished making a 16-mm color film entitled, "Let There be Light". The company will make the film available to utilities, municipalities, contractors, and civic and business organizations.

Theme of the movie is the plight of a crusading businessman in his efforts to obtain improved street lighting in a mythical community. As the crusader carries his battle to the city council, the plot unfolds the social, commercial, physical and psychological benefits to be derived by the community from better street lighting. As in most movies the hero overcomes the obstacles thrown in his path and the film comes to a happy conclusion.

Copies of the film may be obtained from local L-M field engineers or by writing the company at Milwaukee, Wisc.

$4.4 Million Expansion Started by A. O. Smith

A $4.4 million expansion program has been started at the Kankakee, Ill., plant of A. O. Smith Corp. It is expected to be completed by late 1956 and will result in the addition of 270,000 sq ft of additional manufacturing and storage space, increasing present area by over 50%.

At this plant A. O. Smith manufactures its glasslined Permaglas domestic water heaters, Burkay commercial water heaters and a line of home heating and air conditioning equipment, also glass-coated steel farm silos and industrial counterparts, their Permaglas storage units.

Linde Has Second Silicone Plant Nearing Completion

Production at the new $14 million silicone plant of Linde Air Products Co, a Division of Union Carbide and Carbon Corp, is scheduled to start this autumn, according to R. S. Abrams, plant manager. The new plant is on a 1,500-acre site along the Ohio River at Long Reach, W. Va.

Electric service is provided to a substation at the edge of the plant site. Unit substations throughout the plant are equipped with Class H insulated transformers, using Linde silicone insulating resins.

Long Reach will be Linde's second silicone-producing facility. The first plant, operating since 1945, is at Tonawanda, N. Y.

(*More M & M on page* 184)

"You Get Extra Battery Performance –

America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

THANKS TO GOULD FIELD ENGINEERING SERVICE!"

It's a proven fact that regular, systematic battery care can add months, perhaps years, to the life of a battery! Gould's nation-wide Field Engineering Service enables *you* to get the benefit of this added service . . . and lower your over-all battery power costs.

Your Gould Field Engineer's one job is to see that you get maximum service from your batteries. He is factory-trained to instruct your own men as to correct maintenance routines and to help set up a simple record system for anticipating battery needs.

There's a Gould Field Engineer in your area. He's as near to you as your telephone. Call him. And when you see him, ask him for the new Gould Plus-Performance Plan material for your battery maintenance staff.

Always Use Gould-National Automobile and Truck Batteries

GOULD
Batteries

GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

"BETTER BATTERIES THROUGH RESEARCH"

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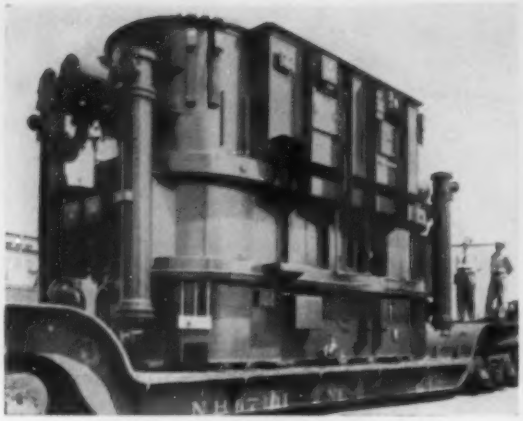

Large Transformer and Bus Duct Go to CEI

Water-cooled 275,000 kva transformer (left) and forced-air cooled 10,000-amp isolated-phase bus duct (right) are enroute to the Eastlake power station of Cleveland Electric Illuminating Co. They will be used with the 260,000 kva liquid-cooled generator which will be installed later this year. These equipments are the largest of the respective types of apparatus built by General Electric Co.

The power transformer will require more than 700 gpm water for cooling. Water from Lake Erie will be pumped through heat exchangers to cool the transformer's 9,540 gal of insulating oil. The 222-ton transformer is 27 ft 6 in. long, 13 ft 8 in. wide and 20 ft high without bushings.

The bus duct encloses aluminum conductors which are unit-supported, with a single insulator at each support. Forced-air cooling is employed for the first time in isolated phase bus. This results in reduction of physical size and weight, according to engineers. They point out that space required in the building design has been reduced by 25% over self-cooled designs.

Illinois Electric Adds Galvanizing Facility

Illinois Electric Porcelain Co has added a galvanizing shop and associated equipment at its Macomb, Ill. plant. The addition will enable the company to apply quality control to Metallic components of insulators and other porcelain products. Illinois's line of standard insulators is distributed by Line Material Co, a division of McGraw Electric Co. Other recent improvements are a ceramics laboratory, testing devices and new production equipment.

Aluminum Production

Primary aluminum production in the United States, according to the Aluminum Association in New York City, was 132,668 tons during July. This was an increase of 5,036 tons over June and 6,500 tons over July 1954. Total production for the first seven months in 1955 was 892,535 tons, up approximately 51,000 tons over the same period in 1954.

MANUFACTURING BRIEFS

Pelton Water Wheel Co, San Francisco, was awarded a contract by Pacific Gas & Electric Co for two turbines for the Poe power plant on the Feather River. Contract calls for two 76,000-hp, 225 rpm, vertical-shaft, reaction-type hydraulic turbines and their auxiliaries for delivery in summer of 1957. Generators and other major equipment were ordered last spring.

International Nickel Co Headquarters of the Central Atlantic Coast Technical Field Section of INCO's Development and Research Division is now located at 1150 York Road, Abington, Pa., near Philadelphia. The section was formerly located at 67 Wall St, New York, N. Y. William C. Mearns continues as its head.

The Texas Co opened a technical service headquarters at Pittsburgh this past month. The office will provide technical service for the iron, steel and aluminum industries and other manufacturers in this area.

At Caracas, Venezuela, the Ministry of Development received bids for three 50,000 kw turbine units for use in the Caroni River hydroelectric power project. Ten firms from France, Germany, Japan, United Kingdom and the United States submitted offers ranging from $5.9 to $12.6 million.

Assembly Products, Inc of Chesterfield, Ohio, manufacturers of moving coil relays and automatic control devices, will soon establish a branch operation and sales office at Desert Hot Springs, Riverside, Calif. Part of the new branch will be a combination office and experimental laboratory where new models of meter-relays will be developed and manufactured.

Union Carbide and Carbon Corp will purchase a long-term leasehold on the entire block between Park and Madison Avenues and 47th and 48th Streets in New York City. The company plans to erect a 41-story building for the new home offices of the corporation, and its divisions and subsidiaries.

. . . for Chase Electrical Insulation

Whatever your electrical tape and insulation requirements, you can't buy better than Chase.

High in dielectric and tensile strength, Chase tapes are made of fabric, plastic, rubber and neoprene to meet all your electrical needs . . . from maintenance to original equipment.

Another interesting Chase product is Chasbestos, a laminated insulating material made of purified asbestos and DuPont Mylar ®. Chasbestos comes in sheets, rolls and tapes for a wide variety of uses where a Class "H" or Class "B" insulation is required.

Send for your copy of the Chase Electrical Insulation File today. Clip check-list below and attach to your letterhead. Chase & Sons Inc., Randolph, Massachusetts.

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AND MAIL TODAY!

Please send me a copy of the Chase Electrical Insulation File. I am especially interested in:

- ☐ Class "B" Insulation
- ☐ Class "H" Insulation
- ☐ Slot Insulation
- ☐ Neoprene Splicing Tape
- ☐ Cable Insulating Tape
- ☐ Cable Binder Tape
- ☐ Cable Jacket Tape
- ☐ Friction, Rubber and Plastic Tape

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PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

SALES ASSIGNMENTS

COMPANY STAFFS

Bristol Co's Socket Screw Division has named Joseph H. Barry sales representative in Pittsburgh-Buffalo area with headquarters in Buffalo. Barry was previously associated with Bristol's Industrial Instruments Division.

Cochrane Corp has appointed M. C. McKeown manager of Philadelphia district sales office. He was technical director of Cochrane's Water Treating Division and manager of technical training.

Combustion Engineering, Inc, has promoted Herman C. Reichard of the Kansas City sales office to district manager in San Francisco.

Electric Controller & Manufacturing Co has appointed C. A. Mitchell, Jr. Pacific Coast district manager. O. J. Archer, sales representative in Washington, has been named district manager in Houston to succeed Mitchell.

International Harvester Co's Motor Truck Division has announced the following changes among its field sales executives: Barr Crawford, district manager at Pittsburgh, has been transferred to St. Louis as district manager to succeed C. A. Samuelson who has retired; H. A. Herman, district manager at Fort Wayne, Ind., has moved to the same post at Pittsburgh; M. J. Gowen, district manager at Richmond, Va., has been named Fort Wayne district manager; R. W. Maxwell has been promoted from assistant district manager to manager at Richmond; M. T. Sprague, district manager at Portland, Orc., has been appointed Oakland, Calif., district manager to succeed Roy A. Legge, retired; and G. S. Stewart, assistant to Sprague at Portland, has been named district manager there.

Leeds & Northrup Co has made several changes in its field sales organization: Joseph M. Jackson, district manager at Buffalo, N. Y., has been transferred to Philadelphia as manager of the district sales office; William L. Kimber, sales engineer in the Buffalo office since 1940, has been advanced to district manager there; W. Spencer Bloor, sales engineer in the Chicago office since 1946, has been promoted to district manager at Atlanta, Ga.; and William A. Macan, III, district manager at Atlanta, has moved to the same post at Cleveland.

J. F. Pritchard & Co of California has appointed Richard S. Brent district sales engineer at Chicago. He joined the company in 1952 as an application engineer.

REPRESENTATIVES

Cochrane Corp has appointed George M. Wallace & Co of Denver, Colo., representatives in the Rocky Mountain district for their line of Cochrane water conditioning equipment, steam specialties, and C-B condensate return systems.

STRONGER THAN THE PIN

In laboratory tests to determine the torsion strength of Kimble *Tempered* Glass Insulators, wood pins were sheared off, and lead-bushed threads stripped, with no failure of the Insulators. Cantilever tests using special alloy pins were discontinued at 10,000 lbs. with still no failure. Ultimate impact tests averaged 130 inch pounds!

Kimble *Tempered* Glass Insulators save installation time because it's never necessary to loosen for lineup with the conductor. Their great strength always allows another quarter-turn.

If it's on the pin, it's in service

Tests far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air. Even lightning surges have failed to damage them. In the event of shattering due to severe mechanical shock, insulator disintegrates into small, non-sharp fragments. Trouble shooters can locate broken insulator—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

Why not see how *tempered* glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Insulator Division, Owens-Illinois, Dept EW-10, Box 1035, Toledo 1, Ohio.

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Potter Heads PUAV

Don B. Potter, administrative vice president of Monongahela Power Co, was elected to the presidency of Public Utilities Association of the Virginias at the 37th annual meeting. After service as second and first vice presidents of the association, Potter succeeds A. J. Bowen, distribution manager of Northern Virginia Power Co.

PUAV elected W. J. Stewart of Wheeling Electric Co first vice president and Pres J. C. Parrott, Roanoke Gas Co, second vice president.

Potter has been associated with Monongahela Power for 26 years. He was appointed assistant to the executive vice president in 1950 and was elected a vice president of the utility two years later. In an expansion of its executive organization last year, Monongahela moved Potter to the post of administrative vice president.

A mining engineering graduate of Carnegie Institute of Technology, Potter was a mining engineer for six years before joining Monongahela Power in 1929.

D. B. POTTER

Arizona PS Makes Major Executive Changes

Six major changes in the executive organization of Arizona Public Service Co have been announced by President Walter T. Lucking. The top-level shifts took place as the utility revamped its operating divisions.

"The company's former Southern Division has been split into three separate divisions," said Lucking, "to enable us to better manage these operations, which are separated by vast distances." Also, Phoenix Division has been expanded to include all cities and towns in Phoenix environs.

William P. Reilly has been named vice president in charge of division operations. He previously served as vice president and manager, Phoenix Division.

Moving from Northern Division to manage Phoenix Metropolitan Division is Vice President F. T. Fahlen, Jr.

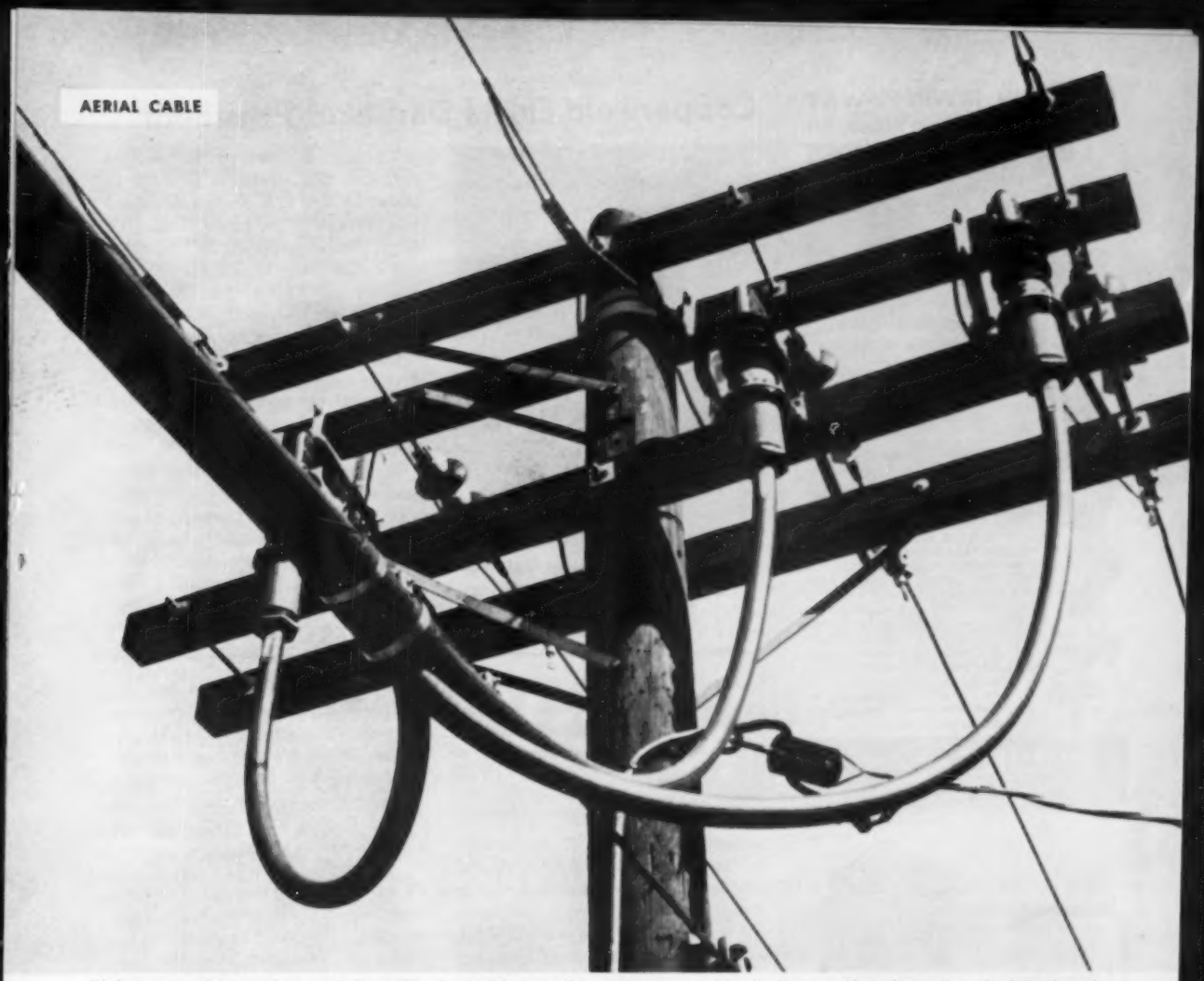
The new manager of Northern Division is Vice President Lee H. Poe, previously Southern Division manager.

In the Southern Division split-up, L. R. Kimmich, Yuma district manager, has been named manager of the new Yuma Division. W. E. Martin moves from district to division manager of Western Division. The rest of the former Southern Division retains that name under managership of Paul B. Beville, Jr, previously Chandler district manager.

W. P. REILLY

F. T. FAHLEN, JR

L. H. POE



High-ozone resistance of Anaconda Type AB-insulated cable pays off here where ozone-cutting is often a problem when ordinary insulation is used.

New aerial cable gives ozone the air

New Anaconda Type AB-insulated cable has *highest* resistance to ozone.

Ozone-cutting – No. 1 enemy of high-voltage insulation – can be arrested.

ANACONDA Type AB butyl insulation on aerial and other high-voltage cable ends this problem.

Type AB is *inherently* resistant to ozone. Moreover, this high resistance to ozone has enabled Anaconda engineers to concentrate on other properties – to develop Type AB's other electrical and physical properties to the very peak of performance.

Proof is in a series of tests – made over a period of years by Anaconda engineers. These tests – covering ozone, temperature, moisture absorption, dielectric strength, ionization level, aging, and other properties – show clearly the superiority of ANACONDA Type AB butyl insulation.

Put your cable problems up to the Man from Anaconda. Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

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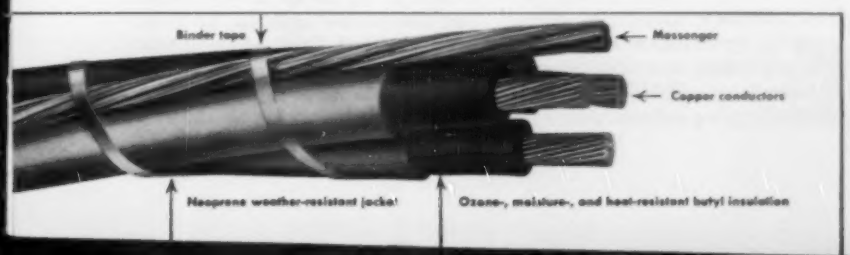

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Use with hand brace as it comes. Order *without taper square shank*, or use hacksaw to convert to 2-Way "Hex" Shank for use in both hand braces and electric drills. It chucks perfectly—no wobble. Fast boring action speeds work. 2-way usage cuts inventory costs. Longer life cuts replacement costs. Hardened full length. Sizes 4/16 to 17/16". Call your mill supply distributor or hardware wholesaler for complete details.

IRWIN Wilmington, Ohio — **HEX SHANK WOOD BITS**

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For dependable performance . . . insist upon *Crapo* Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes *Crapo* Steel Strand first choice for guys, messenger and overhead ground wire.

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- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your *Crapo* Jobber Today!

INDIANA STEEL & WIRE CO., INC. Muncie, Indiana

Copperweld Elects Darbaker President

J. M. DARBAKER

James M. Darbaker has been elected president of Copperweld Steel Co to succeed Frank R. S. Kaplan, advanced to chairman of the board. Henry G. Riter, 3rd, president of National Association of Manufacturers and Thomas A. Edison, Inc, has been elected honorary board chairman and chairman of the finance committee.

Darbaker has been senior vice president of Copperweld since May 1954. Previously he served as director of distribution and availability for United States Steel Corp.

In many years' service with U. S. Steel subsidiaries he was general manager of sales for Carnegie-Illinois Steel Corp and operations manager of that company's Chicago district.

PERSONAL BRIEFS

Georgia Power Co has announced these changes: **J. B. Browder** has been promoted from manager, Commercial Sales Engineering Division, to sales manager of the company; **T. S. Davis, Jr,** manager of Area Development Division, has been named sales promotion manager; **J. E. Sweatte,** commercial sales engineer in Atlanta Division, succeeds Browder; **E. A. Yates, Jr,** has been designated manager, Industrial Development Division; and **F. A. Hood** has been appointed manager of Community Development Division.

Ernest R. Acker, president, Central Hudson Gas & Electric Corp, has been named public utilities chairman of New York State Citizens Committee for Public Schools, a non-profit group formed in 1951 to help New York's communities solve school problems.

Don Thompson has been appointed superintendent of Ellensburg, Wash., City Light to succeed **Jack Kennedy.** Douglas County PUD at Bridgeport, Wash., has upped **William Nordeen** from assistant manager to manager to fill the post vacated by Thompson's resignation during the summer.

Dayton Power & Light Co has promoted **Firman R. Knipp** from assistant supervisor to supervisor of the power sales department succeeding **Sherman F. Swarr,** now assigned to special duties in marketing and rate surveys . . .

Northern States Power Co has appointed **A. L. Burgess** to the new post of assistant controller and **H. A. Stokke** financial accounting manager. Burgess has been financial accounting manager and assistant treasurer, and Stokke, general accounting supervisor and assistant treasurer.

Dr Rene Dupuis, a member of Quebec Hydro-Electric Commission, has been awarded a fellowship in American Institute of Electrical Engineers for "contributions to the electric industry as engineer, author, administrator, and educator."

Virginia Electric & Power Co has named **James S. Hamilton** manager of Albemarle district at Williamston, N. C., and **O. V. Sessoms** operating assistant to the vice president of operations. Hamilton has been director of sales, and Sessoms, Alleghany district manager . . . **Fred Coulter** has been re-elected president of Grundy County (Iowa) Rural Electric Cooperative.

Grant H. Wier has been advanced from assistant comptroller to comptroller of Commonwealth Edison Co . . . Detroit Edison Co has named **Joseph A. McCarthy** assistant treasurer and transfer agent for the company. **Henry O. Chase** has been promoted from assistant paymaster to succeed McCarthy as paymaster of the utility.

Harold Smiddy, vice president of General Electric Co's Consulting Division, has been elected a director of American Management Association for 1955-58 . . . Honorary degree of doctor of science has been conferred on **Dr Joseph Slepian** by England's University of Leeds. Associate director of Westinghouse Electric Corp's research laboratories, Dr Slepian received the award for "contributions to the advancement of science."

Dr Alvin M. Weinberg has been appointed director of Oak Ridge National Laboratory. Previously he was research director of the laboratory, a major research center.

John W. Glendening, Jr, has been named general counsel of Commonwealth Services, Inc, succeeding George L. Brain (EW, Sept. 19, p 274) . . . DeLaval Separator Co has promoted **Frank E. Sullivan** to chief engineer-industrial processes . . . New manager of sales for Malleable Iron Fittings Co's Pole Hardware Division is **Owen R. Higgins.**

Electric Storage Battery Co's Exide Industrial Division has appointed **Morrison McMullan, Jr,** controller and **Ervin Seltzer** manager of industrial engineering. McMullan was promoted from the post of division budget director, and Seltzer previously served as manufacturing services manager, Stokes Molded Products Division.

James B. Carse has been named marketing manager of H. M. Harper Co, Morton Grove, Ill. . . . **Richard A. Ogden,** treasurer and assistant to the president of Permutit Co and subsidiaries, has been elected secretary in addition to his other duties.

OBITUARY

Walter D. Dent, 77, president of Lockhart (S. C.) Power Co, died at Union, S. C. Associated with the utility since 1913, Dent was elected president three years ago.

Lafayette Hanchett, 87, retired chairman of the Board, Utah Power & Light Co, died at Salt Lake City, Utah. He served nine years as UP&L president and 24 years as chairman until his retirement in 1953.

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Photo shows Pengo Tension Wire Stringer used by Pacific Gas and Electric Company to string 266,800 cir-mil all-aluminum 22KV line at Pacific Grove, Calif.

New equipment makes it possible to get uniform controlled tension so that conductors can be tied in without further sagging!

Safest way yet devised to string conductor through energized lines!

Reduces cost of Line Stringing because it

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Write for additional information

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Santa Clara, Calif.

MEETINGS CALENDAR

An extended list of coming meetings appears in the last issue of each month

OCTOBER

***PENNSYLVANIA ELECTRIC ASSOCIATION**—Hydraulic Power Committee, Fall Meeting, Skytop Lodge, Skytop, Pa., Oct. 3-4; Communications Committee, Hotel William Penn, Pittsburgh, Oct. 6-7; Meter Committee, Bedford Springs Hotel, Bedford, Pa., Oct. 13-14; Systems Operation Committee, Hotel Harrisburger, Harrisburg, Pa., Oct. 20-21; Prime Movers Committee, Clearfield, Pa., Oct. 20-21; Electrical Equipment Committee, Hotel New Yorker, N. Y., Oct. 27-28; Relay Committee, Pocono Manor Inn, Pocono Manor, Pa., Oct. 31-Nov. 1.

EDISON ELECTRIC INSTITUTE—Meter and Service Committee, Hotel Syracuse, Syracuse, N. Y., Oct. 3-5; Prime Movers Committee, Hotel Cleveland, Ohio, Oct. 3-5; Area Development Workshop, Sheraton Hotel St. Louis, Mo., Oct. 10-12; Electrical Equipment Committee, Shoreham Hotel, Washington, Oct. 17-18.

NATIONAL ELECTRONICS CONFERENCE, INC—Hotel Sherman, Chicago, Oct. 3-5.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Fall General Meeting, Morrison Hotel, Chicago, Oct. 3-7; Application of Motors to Space Heating and Cooling Equipment Conference, Chase Hotel, St. Louis, Mo., Oct. 19-20.

***ELECTRIC COMPANIES ADVERTISING PROGRAM**—Copy Group Meeting, Park Plaza Hotel, St. Louis, Oct. 4; Management Group Meeting, Pierre Hotel, New York City, Oct. 26.

ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM—Workshop Conference, Chase-Park Plaza Hotels, St. Louis, Mo., Oct. 5-7.

INDIANA ELECTRIC ASSOCIATION—Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 5-7.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Sales & Rural Conference, President Hotel, Kansas City, Mo., Oct. 5-7.

***INTERNATIONAL ASSOCIATION OF ELECTRICAL LEAGUES**—20th Annual Conference, Sheraton King Edward Hotel, Toronto, Ontario, Oct. 5-8.

***AMERICAN MANAGEMENT ASSOCIATION**—Managing Product Research & Development Seminar, Hotel Sheraton Astor, New York, N. Y., Oct. 6-7.

***SOCIETY OF INDUSTRIAL DESIGNERS**—11th Annual Meeting, Hotel Woodner, Washington, D. C., Oct. 6-8.

IOWA UTILITIES ASSOCIATION—8th Annual Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, Oct. 10-11.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Lubrication Conference, Hotel Antlers, Indianapolis, Ind., Oct. 10-12.

WISCONSIN UTILITIES ASSOCIATION—Electric & Gas Sections, Schroeder Hotel, Milwaukee, Oct. 12-14.

OKLAHOMA UTILITIES ASSOCIATION—Eastern Electric Light & Power Division, Okmulgee, Okla., Oct. 13; Western Electric Light and Power Division, Norman, Okla., Oct. 14; Accounting Section, Lawton, Okla., Oct. 21.

***NORTHWEST UTILITY RADIO ASSOCIATION**—Annual Meeting, Electric Building, Portland, Ore., Oct. 13-14.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS—Fall Meeting, Peabody Hotel, Memphis, Tenn., Oct. 14-15.

SOUTHEASTERN ELECTRIC EXCHANGE—Accounting Conference, Hotel San Carlos, Pensacola, Fla., Oct. 20-21; Sales Conference, Biltmore Hotel, Atlanta, Ga., Oct. 27-28.

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS—67th Annual Convention, Grove Park Inn, Asheville, N. C., Oct. 24-27.

***NATIONAL INDUSTRIAL CONFERENCE BOARD, INC**—Atomic Energy in Industry, 4th Annual Conference, Waldorf-Astoria Hotel, New York, N. Y., Oct. 26-28.

NOVEMBER

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—Northeast Region Fall Meeting, Hotel Niagara Falls, Niagara Falls, N. Y., Nov. 1-3.

ASSOCIATION FOR APPLIED SOLAR ENERGY—World Symposium on applied solar energy, Westward Ho Hotel, Phoenix, Ariz., Nov. 1-5.

EDISON ELECTRIC INSTITUTE—Taxation Accounting Committee, sponsored jointly with American Gas Association, Plaza Terrace Hotel, Cincinnati, Ohio, Nov. 3; Accident Prevention Committee, Beaumont Hotel, Beaumont, Tex., Nov. 13-18; Industrial Relations Committee, Joint Meeting with New England Personnel Group, Somerset Hotel, Boston, Nov. 17-18.

PACIFIC COAST ELECTRICAL ASSOCIATION—Business Development Section Annual Conference, Huntington-Sheraton Hotel, Pasadena, Calif., Nov. 3-4; Hawaiian Section Conference, Honolulu, Nov. 9-10; Administration Services Section Meeting, California Hotel, Fresno, Calif., Nov. 16-17.

AMERICAN SOCIETY OF ELECTRICAL ENGINEERS—Eastern Joint Computer Conference, Hotel Statler, Boston, Nov. 7-9.

INDUSTRIAL MANAGEMENT SOCIETY—19th Annual Time and Motion Study and Management Clinic, Sherman Hotel, Chicago, Nov. 9-11.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Diamond Jubilee, Congress, Hilton & Blackstone Hotels, Chicago, Nov. 13-18.

NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION—Annual Meeting, Traymore Hotel, Atlantic City, Nov. 14-18.

CHICAGO EXPOSITION OF POWER & MECHANICAL ENGINEERING—Chicago Coliseum, Nov. 14-18.

AIR CONDITIONING & REFRIGERATION INSTITUTE—9th Air Conditioning & Refrigeration Exposition, The Auditorium, Atlantic City, N. J., Nov. 28-Dec. 1.

***ELECTRIC COMPANIES ADVERTISING PROGRAM**—Copy Group Meeting, Ayer Studio, New York City, Nov. 30.

DECEMBER

NATIONAL ASSOCIATION OF COST ACCOUNTANTS—Fairmount Hotel, San Francisco, Dec. 2-3.

AMERICAN WATERSHED COUNCIL, INC—Second National Watershed Congress, Statler Hotel, Washington, D. C., Dec. 5-6.

INTERNATIONAL EXPOSITION—25th Exposition of Chemical Industries, Convention Hall, Philadelphia, Pa., Dec. 5-9.

ENGINEERS JOINT COUNCIL—Nuclear Engineering & Science Congress, Public Auditorium, Cleveland, Dec. 12-16.

EDISON ELECTRIC INSTITUTE—Industrial Relations Committee, EEI Headquarters, N. Y., Dec. 15.

JANUARY 1956

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Winter General Meeting, New York, Jan. 30-Feb. 3.

FEBRUARY

EDISON ELECTRIC INSTITUTE—National Industrial Electric Heating Conference, Netherland Plaza Hotel, Cincinnati, Feb. 6-10.

AMERICAN SOCIETY FOR TESTING MATERIALS—Committee Week, Hotel Statler, Buffalo, Feb. 27-March 2.

MARCH

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Edgewater Beach Hotel, Chicago, March 12-16.

* Additions this week

POWER BRIEFS

● More underground wiring for Hawaiian Electric Co is being strongly advocated by two daily newspapers and a civic group in Honolulu. The utility's present policy is to contribute equivalent cost of overhead wiring to cost of underground facilities and require property owners to put up the difference. HECO favors underground wiring, but estimates the cost of burying its present high-flying wires at $320 million.

● Fire and a series of explosions rocked a California Oregon Power Co substation recently, knocking out two 2,250-kva transformer banks. Dorris, Calif., had no power for a day until the utility rushed in a mobile transformer bank from Medford, Ore. V. W. Hammond, company distribution engineer, estimated damages at $75,000 and reported the cause had not yet been determined.

K. L. Neibauer shows you the new 400-ampere frame recloser, a 3-phase, heavy-duty unit, rated 15 kv; available also in a 280-ampere frame.

EXCLUSIVE!

New 400-amp recloser

to protect high load substations

Highest Capacity Recloser Provides 2-3 Cycle Opening, Fast Power Restoration

Now—and for the first time—Westinghouse offers you power restoring reclosers rated to 400 amperes, with up to 6000 amperes interrupting capacity. Developed to meet mushrooming system loads, this equipment is today's biggest bargain in low-cost fault protection.

Consider first the 2-3 cycle high-speed opening—you get much greater protection against line burn down. Consider also the dependable Westinghouse De-ion® arc quencher which gives you the fastest known arc extinction, the surest contact protection. Air dash pot timing, used on this recloser, is unaffected by temperature changes. And for convenience, a variety of easily set tripping sequences. Two more unique features of this high-capacity recloser are condenser bushings and bushing-type current transformers.

These are, of course, all Westinghouse exclusives—altogether a new concept of recloser protection—providing you with a recloser built to the quality standards of a circuit breaker. Through and through, simple design and rugged construction mean operational reliability you'd expect from 30 years of breaker design experience.

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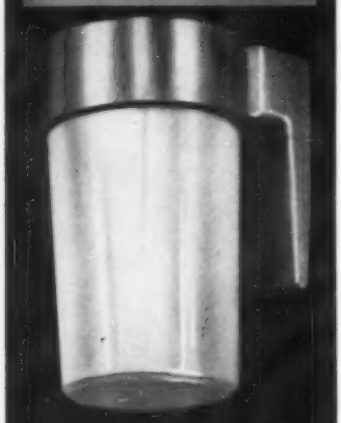
Westinghouse

design by mc Philben



A Vapor-Tight Wall Bracket

dynamically new . . . obsoletes all old wall brackets!

If a utility man went into the lighting fixture business, we'd like to think he'd like to work for McPhilben. Why? Because so many of the practices we follow, so many of the principles we live by . . . these are the standards the electric utilities have always fought for in their efforts for better lighting.

Note our emphasis on "design by McPhilben". And here design means *maximum fitness for purpose* . . . the right materials, construction, utility, ease of maintenance, appearance—and cost, too.

A classic example—McPhilben's new multi-use wall bracket (43-40 VT) shown above. Beautifully honest of design, rugged of die cast aluminum, vapor-tight, and versatile for so many applications—in home, business and industry. We feel any utility man would be proud to recommend it.

What would you like to know about McPhilben, and the most progressive line of fixtures in lighting?

DIE CAST PROTECTIVE GUARD AVAILABLE (43-44VT) for locations where protection against theft and vandalism is essential. Also available as a ceiling fixture.

1247 Willoughby Avenue, Brooklyn 37, N. Y.

CONSULT mcPhilben Lighting SPECIFY

Representatives in major cities
Stocked By Electrical Wholesalers

Trinity Project Speeded

. . . as Reclamation Bureau opens bids for exploratory drilling near California dam site; $1-million appropriation being used

The Bureau of Reclamation is wasting no time in putting to use a $1-million appropriation to start construction on the $225-million Trinity River Project in California.

Last week to get the project rolling, the Bureau opened bids on the first contract calling for exploratory drilling near the main dam site. Amount of the contract will be between $30,000 and $35,000.

Plans to begin work in October were mapped at a meeting of Reclamation Commissioner Wilbur A. Dexheimer, and Clyde H. Spencer, the Bureau's Region II director, in Sacramento. Congressman Clair Engle (D) of California, chairman of the Insular and Interior Affairs Committee in the House and author of the Trinity authorization bill passed in the closing hours of the recent congressional session, attended the meeting.

The trio will participate in the dirt-turning ceremony tentatively set for mid-October.

Dexheimer pointed out that $1 million will not go very far in the construction program but he said it will be the purpose of the Bureau to do some work while engineering plans for the project are being completed. A small contract for initial work, he said, will be let next spring.

"The essential thing is to get the Trinity started," Engle asserted. "Difficulties have a way of unravelling themselves and can be resolved while construction is under way."

One of the problems referred to was the Bureau's study of a Pacific Gas & Electric Co offer to build the power facilities on the project.

Congress directed the Bureau to investigate the offer and submit a report in 18 months. Commissioner Dexheimer declared the studies will not interrupt the work. "We can proceed a good long way while the studies are in progress," Dexheimer commented.

Congressman Engle said he plans to press for a $15-million appropriation for the Trinity Project for the next fiscal year.

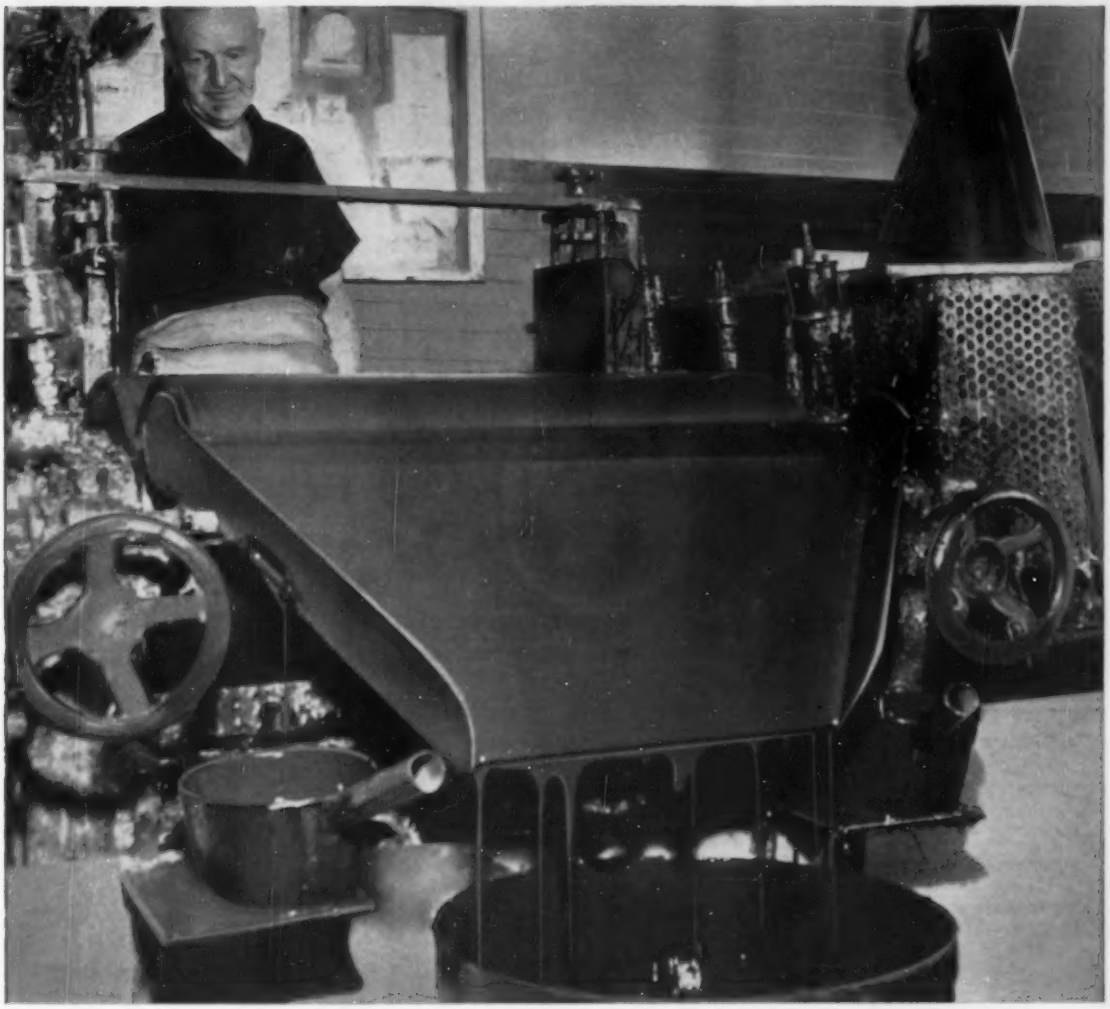
PP&L Role in Springfield, Ore., Studied

The Springfield, Ore., Utility Board has authorized a move toward engineering studies which could lead to an attempt to acquire competing facilities of Pacific Power & Light Co (EW, Aug. 22, p 201).

The action followed a lay committee report which recommended negotiations to avoid duplication of costs involved in the two utility systems whereby the municipality serves most of the residential customers and the investor-owned utility, the commercial and industrial firms. The committee had made no proposal that the city attempt to buy out the private system's lines, but the report did state that any such attempt should first place the question of a bond issue before the electorate.

The Utility Board's proposal took the form of a letter to Springfield council in which Chairman W. Boeshans noted the lay committee named by Mayor Edward Harms was composed of men "unskilled in electrical engineering. This report, therefore, should be given only that weight in solving the general problem as a layman's report." Superintendent Frank Brown subsequently was directed to interview consulting engineering firms.

FIRE HAZARD FOILED!



VINYL RESIN PLASTICIZERS AND VOLATILE SOLVENTS!

Wherever highly combustible materials are used — as in this "dope room" at the Athol Manufacturing Company's Massachusetts plant, a potential fire hazard is *always* present!

Athol executives were keenly aware of the importance of *dependable, automatic* fire protection to provide the maximum in safety measures. So Athol called on Kidde — leaders in the field of fire extinguishing equipment.

Kidde engineers analyzed the various hazards, installed a 20-cylinder CO_2 extinguishing system which would automatically snuff out fire the instant it showed itself. In addition, pressure-operated trips were incorporated in the system to shut doors and windows, shut off fans and motors and to sound an alarm.

See to it that every fire hazard in *your* plant — machinery, flammable liquids, electrical equipment — gets the *best* in fire protection. Contact Kidde today!

Kidde

The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc.
1030 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

Two New Minerallac Quality Products Designed for Jobs Too Heavy for Standard Jiffy Clips

MINERALLAC
Hevi-Duty AND Medium
JIFFY CLIPS

Also available without mounting hole for use with gun.

patent pending

Made of heavier materials! Has exclusive inverted rib, that provides more strength at the bend of clip . . . and, of course, adds the benefits of famous "Snap On" feature!

In stock in Zinc-Plated Steel for Thin Wall or Rigid Conduit up to 6". (Hot Dipped Galvanized may be obtained on order) Can be substituted for malleable clips.

Order From Your Electrical Wholesaler

SEND FOR LITERATURE
MINERALLAC ELECTRIC COMPANY
25 North Peoria St. Chicago 7, Ill.

MINERALLAC

THIEL
TRANSFORMER HANGERS

THIEL Hangers are made according to NEMA specifications — heavy gauge steel construction, hot-dip galvanized for dependable service and long life. Two styles complete with galvanized bolts and nuts. In stock for immediate delivery.

MODEL	1-PHASE	3-PHASE	WEIGHT
T-1	3-15 KVA	9 KVA	16¼ lbs.
T-2	25—37—50 KVA	15-45 KVA	37¼ lbs.

C-TYPE HANGERS
Two sizes - for 75-100 KVA 1-phase and 75-112½ KVA 3-phase transformers.

HANGER KICKERS
In sizes to fit T-type Hangers — in four and five mounting positions.

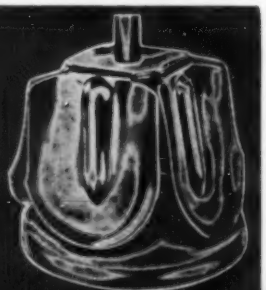
Electrical Fasteners That Hold . . .

THIEL TOOL & ENGINEERING CO. INC.
1417 No. Market St. • St. Louis 6, Mo.

In the dynamic electric power industry, engineers and executives prefer Electrical World 4 to 1 . . .*

*Year after year, advertisers, (and their agencies) survey their best customers and prospects: *"What one publication is most useful to you?"* Almost without exception the preference for Electrical World runs 4 to 1, or better.

SPECIFY
Grip-Tite
EXPANDING ANCHORS



GRIP-TITE MANUFACTURING CO.
WINTERSET, IOWA
"Pioneers in the Anchor Field"
IN CANADA: LINE AND CABLE ACCESSORIES, LTD. • TORONTO

Commonwealth Ed Begins Radio Network Expansion

Commonwealth Edison Co of Chicago has started work to improve communications for its operating forces by adding a more powerful network to the company's two-way radio system.

A new 450-megacycle system is being installed to supplement the 158-megacycle system which will continue in operation. The new installation will be used exclusively by the service and meter departments.

Workmen are shown above erecting an antenna for the new system atop an existing 150-ft tower.

Utility, Power District Sign Coordination Pact

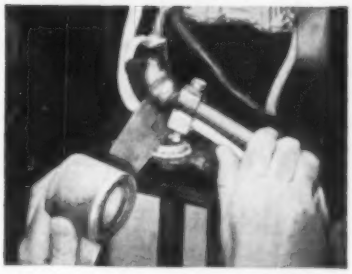
A power coordination agreement, recently signed by Arizona Public Service Co and Salt River Power District, redefines service areas and provides for further sales and interchange of power.

The pact brings up to date a similar 50-year agreement made in 1928 by Salt River Valley Water Users' Association and Central Arizona Light & Power Co.

Because of intermingling of service areas the new agreement does not change the district's and private utility's competitive rates. The two organizations plan revisions for power interchange from time to time in amounts and for periods as will be consistent with orderly development of their systems.

Volseal...

the new high dielectric putty...



makes sealing easier!

New Johns-Manville Volseal is a high dielectric putty designed for sealing heavy cables and irregularly shaped objects. It has a dielectric of 445 vpm, together with excellent physical properties. Resists acids and alkalis, weathers well, is highly resistant to water, does not corrode metals.

Volseal also offers easy application. It is highly elastic, provides good adhesion, hardens within 3 hours on air curing. Available in extruded beads, ribbons and pugs. For complete details on Volseal and its new companion product Napseal, the petroleum resistant sealing compound, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

Johns-Manville
SEALING COMPOUNDS

Two New Maps Plot Utilities and Uranium

Two new maps plotting electric utility facilities and uranium deposits are available from government offices in Washington, D. C.

A series of eleven regional maps charts "Principal Electric Utility Generating Stations and Transmission Lines in the United States." This 1955 series is obtainable at 50¢ each or $5 for the lot. Write Office of Public Reference, Federal Power Commission, Washington 25, D. C., for order number FPC-M-43.

Uranium deposits in the U. S. are charted in a new map prepared for Atomic Energy Commission by U. S. Geological Survey. It plots deposits now being worked and those too low in grade to be mined under present conditions. Map MR-2 can be obtained for 50¢ from U .S. Geological Survey Distribution Center, Washington 25, D. C.

Alaska Power Site Eyed

Potential site for biggest power development in North America is Reclamation Commissioner Wilbur A. Dexheimer's description of Rampart, Alaska, 100 miles northwest of Fairbanks. Water gauging studies of the Yukon River have been initiated by Bureau of Reclamation to get an indication of the Alaska interior's hydro potential. The Bureau is particularly interested in Rampart from which power could be transmitted to Seward and other points on the coast.

Record British Coal Loss

Britain's nationalized coal industry was hit with a record loss of more than $53.2 million for the second quarter this year. This deficit, $40 million more than the largest previous loss in the fourth quarter of 1951, adds substance to reasons given for the recent hike in electrical rates. During the summer Britain's Central Electricity Authority "reluctantly" announced a rate increase made necessary by the high cost of coal (EW, Aug. 1, p 44). To maintain its continental market Britain exports much of its own coal and imports from U.S. to help meet domestic demand.

Thompson Field Research, the most extensive in the industry, now tells you the best way to destroy all mixed brush and hardwood growth during the dormant season . . . effectively . . . economically.

Thompson's proven spray techniques and its Broad Spectrum Bramblcide deliver almost complete kills at unequalled low cost.

In addition to the economy, and better employment of manpower, dormant season basal bark control (and stump treatment) is free from the possibilities of danger to susceptible crops and helps to further public good will.

Many of the world's largest users of herbicides specify Thompson, one of America's few basic manufacturers of selective herbicides. Inquire.

Write for Research Station Papers No. 19 and 21, mentioning type of brush to be controlled and number of miles of right-of-way involved. Favorable utility chemical prices submitted on request.

Thompson Chemicals

THOMPSON CHEMICALS CORP.
St. Louis 3, Mo. • Los Angeles 27, Calif.

FIRST NAME IN BRUSH KILLERS

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant
Positions Wanted
Part Time Work

Civil Service Opportunities
Selling Opportunities Wanted
Selling Opportunities Offered

Employment Agencies
Employment Services
Labor Bureaus

DISPLAYED ——**RATES**—— **UNDISPLAYED**

The advertising rate is $19.15 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to ELECTRICAL WORLD, 330 W. 42nd St., N. Y. 36, N. Y., for October 17th issue closing October 7th

IN WHAT FIELD OF ENGINEERING ARE YOU INTERESTED?

Our engineering work includes distribution investigation, system planning, transmission line design, substation design, general gas engineering and the operation of steam electric generating plants.

Free group life and hospitalization insurance, liberal sick leave plan, five day week and a liberal vacation plan are but a few of the benefits you will receive. Engineering positions are available throughout lower Michigan. If you have a recent degree in electrical or mechanical engineering, we suggest that you investigate these career opportunities.

Apply in person or write to: R. E. Beatty,

CONSUMERS POWER CO.,
212 W. Michigan Ave. Jackson, Mich.

IMPORTANT TEACHING POSITIONS OPEN IN ISRAEL

Technion, Israel Institute of Technology, in Haifa, Israel, proposes to appoint:

Professor of Structural Engineering
Professor of Hydraulic Engineering
Professor of Mechanical Engineering
Professor of Mechanical Engineering with special qualifications in Applied Thermodynamics
Professor of Electronics and Telecommunications Engineering
Professor of Mathematics

Applicants should have first-rate professional and academic qualifications, be willing to integrate themselves into the life of the country and, in due course, to teach in Hebrew.

Applications with full details should be sent in duplicate, for transmission to Haifa, to the:

AMERICAN TECHNION SOCIETY
1000 Fifth Avenue New York 28, N. Y.

JUNIOR DISTRIBUTION ENGINEER

Electric utility serving in the East desires a graduate electrical engineer with some experience in the distribution field, preferably with a public utility. Permanent position—salary dependent on experience and ability. Applicants please include complete resume of experience and qualifications.

P-7618, Electrical World
330 W. 42nd St., New York 36, N. Y.

WANTED
Journeymen-Linemen

Qualified Journeymen Linemen for transmission and distribution construction and maintenance by small utility in Eastern Seaboard Section; prevailing wages—I.B.E.W. Good working conditions, liberal fringe benefits. Must be not over forty, be able to pass physical examination, have good all around experience with a public utility.

P-7854, Electrical World
330 W. 42nd St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1111 Wilshire Blvd. (17)

POSITIONS VACANT

Electrical Engineers—Power Major—Several assistants and juniors—assistants minimum 5 years experience—juniors 2 to 3 years experienced in electrical design, operation and construction of steam, diesel, hydro, electric plants and substations. Permanent position with long established consulting organizations for public utility operating companies located Latin America. Headquarters New York. Some travel necessary in future. Knowledge of Spanish or Portuguese useful—not essential. Salary commensurate with qualifications. Good opportunity. Reply stating age, education, experience, personal particulars, and minimum salary expected. P-7821, Electrical World.

Sales Engineering excellent career opportunities for several electrical engineers, recent graduates to age 30. Nationally known wire and cable manufacturer will train you for sales engineering positions. Previous sales experience not required. Training at plant located in Northeast. Placement will be in branch offices throughout U. S. Reply giving age, education, include recent photo. P-7724, Electrical World.

Engineering Manager: Progressive electrical manufacturing concern has opening for engineering manager, electrical or mechanical engineer degree preferred. Must be aggressive with administrative experience and the complete knowledge of substation, transmission and distribution systems. All applications will be kept in strict confidence. Mail resume to P-7739, Electrical World.

Staff Assistant progressive manufacturing concern desires aggressive man perferably electrical engineer between the ages of 28-35 to function as staff assistant to general sales manager. Must have advertising and sales promotion background. This is an excellent opportunity for the man who wants to get ahead. Mail detailed resume to P-7740, Electrical World.

EMPLOYMENT SERVICES

Salaried Personnel. $5,000-$30,000 This Confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, P. O. Box 674, Manchester, Vermont.

POSITION WANTED

Relay engineer; graduate E.E. Experienced relay applications; settings; power system studies; power plant and system design. PW-7709, Electrical World.

WANTED
ELECTRICAL UTILITY ENGINEER
WITH DISTRIBUTION EXPERIENCE
Write:
Chief Electrical Engineer
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
SPRINGFIELD, ILLINOIS

DESIGN ENGINEERS

WANTED by 40 year old electrical equipment manufacturer, Switchboard and control experience with some electronic knowledge desired. Also electric machinery designer wanted. Write the ELECTRIC PRODUCTS CO., 1725 Clarkstone Road, Cleveland 12, Ohio. Attention Chief Engineer.

What Is *Your* Problem?

Do you need competent men — men experienced in the industry served by this publication? Men to fill executive, sales or technical positions? OR—are you seeking employment in any of these capacities?

The 25,000 other subscribers of ELECTRICAL WORLD are the logical ones to contact for a solution to your problem. They are identified with the same industry and speak your "language." You can get their attention—at small cost—through an advertisement here.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

UNDISPLAYED RATE:

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.50 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

SEND NEW ADVERTISEMENTS TO: 33 W. 42 ST., N. Y. 36, N. Y., for October 17th issue closing October 7th

ELECTRICAL WIRE AND CABLE

—YOUR BEST SOURCE—

• for every industrial and power application
• Odd lengths—long and short—reasonably priced

One of the Largest Stocks in the Midwest

Let us quote on requirements—
send your inquiries
We'll also buy your Surplus

Branch Offices:
Houston— Los Angeles—
Walnut 3-4590 ANgeles 3-5148

FOR YOUR TEMPORARY NEEDS TRY OUR SURPLUS DIVISION

UNIVERSAL Wire and Cable Co.

2664M N. Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

PERIODICALS

A.I.E.E. transactions back-volume wanted to buy for cash. Ashley, 24 E. 21, N.Y.C. (10).

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4522) will be received at Denver, Colorado, until November 17, 1955, for furnishing two or three sets each of two motor-driven, vertical-shaft, turbine-type pumping units, each set with a capacity of 500 gpm under a total head of 1,740 feet; one diesel-electric generating set for driving above pumps; and motor control equipment for Anjar Spring Pumping Plant, Lebanon Project. Delivery is desired within 345 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 2, Colorado. W. A. Dexheimer, Commissioner.

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4523) will be received at Denver, Colorado, until November 15, 1955, for furnishing three 5,000-kva, 63.5/110 wye-to 19.92/34.5 wye x 39.85/69 wye-kilovolt, single-phase, outdoor autotransformers; and one 2,000-kva, 41.8 delta- to 7.2/12.47 wye-kilovolt, 3-phase, outdoor autotransformer for Missouri River Basin Project, North and South Dakota. Delivery is desired within 210 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado. W. A. Dexheimer, Commissioner.

"SEARCHLIGHT" IS Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

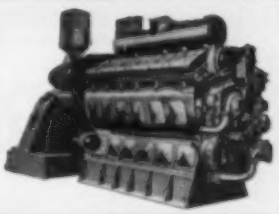
Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

DIESEL POWER

IMMEDIATE SHIPMENT
• PURCHASE OR RENTAL
UNIT CAPACITIES—10 TO 2475 KVA
A.C.—50 AND 60 CYCLES
• ALSO D.C. UNITS



A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1150	Worthington	SEH-6	1685	280	320	Superior	60E-6	460	450
1138	Fairbanks Morse	38D	1600	720	300	Fairbanks Morse	32E14	430	300
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	430	1200
1000	General Motors	16-567B	1440	720	250	Clark	GD-4	370	360
750	General Motors	12-567	1080	720	200	General Motors	8-268A	300	900
700	Worthington	EE-6	1000	327	175	General Motors	12-71	275	1800
675	Fairbanks Morse	38D	980	720	150	Buckeye	80	240	600
500	General Motors	8-567	720	720	148	Fairbanks Morse	32E14	220	300
500	Alco	6-12 1x12T	750	600	100	General Motors	3-268A	150	1200
350	Baldwin	VO-6	510	450	60	General Motors	6-71	90	1200
320	Enterprise	DSG-6	460	450					

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50-52 CHURCH ST., NEW YORK 7, N. Y.

FOR SALE

2—15 H.P. Motorized Speed Reducers 1750 to 42 RPM, 220/440 V 3 ph 60 cy
5—20 H.P. Ditto but 1750 to 37 RPM
15—25 KVA West. Dry Type Transformers 2400/4160 to 120/240 V.
7—10 KVA Ditto
9—25 KVA G.E. Pyranol Transformers 2400/4160 to 120/240 V.
1600 ft. #1-3 cond. 3000 V. Neoprene Copper Cable
12,000 ft. #8-3 cond. 3000 V. Neoprene Copper Cable
902 ft. #4-3 cond. 3000 V. Neoprene Copper Cable

7—40 H.P. Wound Rotor Motors 900 RPM 220 V.A.C.
1—50 H.P. Wound Rotor Motor 900 RPM 220 V.A.C.
5—75 H.P. Squirrel Cage Motors 1800 RPM 2200 V.A.C.

10 Capacitors 7½ KVA 230 V 3 ph 60 cy.
11 Capacitors 15 KVA 2400 V 1 ph 60 cy.

1—4500 Watt Office heater 230 V.
3—3000 Watt Office heaters 230 V.

RODEN COAL COMPANY
MARVEL, ALABAMA

TRANSFORMERS

FOR SALE

3—1000 Kva Mol. 11500-2400/4160Y
3— 500 Kva W-H 23000-2300/2400
3— 500 Kva G-E 22000-2300/4000Y
5— 333 KVA W-H 38000-7200/12470Y
3— 333 KVA G-E 33000-2300/4000Y/6900/11950Y
3— 333 KVA G-E 7200/12470Y-2400/4160Y
3— 333 Kva Wagner 6900/11950Y-7200/12470Y
3— 250 Kva G-E 2415/2300-600
6— 200 KVA G-E 13200-2400/2300
6— 200 KVA G-E 13200-230/460

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio

40 Years' Dependable Service

Save Money — Save Time

Contact us for prices, on large power equipment of all kinds. Prompt shipment from inventory. Send for our complete catalog.

BELYEA COMPANY INC.
51 Howell St. Jersey City, N. J.

New and Used Equipment Available for
POWER PLANTS, SUBSTATIONS, TRANSMISSION LINES AND CONSTRUCTION
Send for new list to
EBASCO SERVICES INCORPORATED
APPARATUS EXCHANGE Two Rector St., New York 6, N. Y.

Con Edison Tells Public The Facts

Consolidated Edison Co of New York scored a public relations bull's-eye with its Westchester customers when it ran the advertisement shown below after Hurricane "Connie."

As a result of the response to the advertisement, a Con Edison vice president said, "It is apparent that the public, knowing our problem, is more than willing to give us a break." This also points up what Con Edison did —it told the public its problem.

As can be seen, the company went into considerable detail. It explained how it had attempted to alert the public to what it might expect, how it assembled emergency materials in strategic spots, alerted company personnel, and otherwise prepared for the storm.

The utility told what courses it followed after the storm hit, what actions were given priority, and why. It took the opportunity to point out the damage that trees, no matter how beautiful, can cause. And it explained to the public the difficulties that arise when thousands of customers call the company at the same time to find out what has happened.

Finally, Con Edison told what it is doing to minimize damage in future, such as the replacement of open wire distribution lines with self-supporting aerial cable in heavily treed areas. Of interest too, was the box score arrangement comparing the damage from Connie with that of two previous storms, and the time it took to restore service.

The Daily Argus of Mount Vernon, N. Y., editorially congratulated Con Edison for the advertisement and the "very valuable frank talk. In taking into its confidence the people it serves electricity and gas—and that means most of the 700,000 persons in the county—the utility has performed a service to itself and to its patrons," said the paper.

WE ARE VERY THANKFUL

Devastating storms have occurred in this section of our country with greater frequency during the last few years, each having unique characteristics and presenting new problems to those engaged in the task of restoring normal conditions. Several vicious hurricanes have struck the northeast, the last one inflicting the most disastrous floods in the history of six States.

Westchester County was fortunate in having been spared the appalling destruction and loss of life that was suffered in many areas during the present season's tropical storms. For this we are deeply grateful and to those people in the stricken communities go our heartfelt sympathy.

Actually, Hurricane Connie gave us a pretty rough time. We caused a good deal of damage here and disrupted electric service to thousands of our customers. Hurricane Connie stopped production upon Con Edison quite unlike those presented by previous storms, and a number of our friends have suggested it would be a good idea to tell you about some of them, and to mention what preparations we made for the hurricane and, indeed, what we did to restore service to our customers. As we do this, we want to keep in focus all the time the fact that we are very thankful it wasn't worse —and grateful to our customers for their patience and understanding, appreciative of the know-how and spirit of public service manifested by our employees.

PUBLIC FOREWARNED

Before the hurricane struck, Con Edison issued warnings and instructions to the public regarding the impending storm and the danger of fallen wires. Of course, we had no way of knowing ahead of time exactly what form this capricious hurricane would take nor what extraordinary conditions would confront us in the work of service restoration. There is no one definite and complete method of combatting a storm that can be decided upon beforehand, but from experience we can infer certain precautions which are helpful in coping with abnormal conditions. This we did.

Supplies of poles, wires, cable and other equipment were established at strategic places for immediate use. Essential personnel was alerted. Just where the storm would be hardest in our territory of some 300 square miles we didn't know, but when Connie hit today—on Saturday, August 13th—all available personnel of Con Edison were, once again, At Work at construction forces from our New York City Operations were asked also they also were assigned to the job of restoring service here. In addition, local electrical contractors, and our customers, broke were engaged to supplement the work of our own crews. More than 1,000 persons took part in this one gigantic task.

CONNIE HITS HARD

As shown in the "Box Score" printed below, Connie knocked out of service more electric customers than did either Hurricane Hazel last year or the "Silver Freeze" in 1953—nearly 60,000 for periods ranging from fewer than 30 minutes to more than a day in some isolated instances. (We have approximately 227,000 electric customers in Westchester County.) The maximum number of customers out at any one time was 32,500 at noon, Saturday.

In a major emergency, such as this, the first thing we do is to make sure that our service facilities are safe. This means that fallen wires must be cut off and rendered harmless and all poles in dangerous condition taken care of. Our next responsibility is to survey the damage and to patrol the primary circuits, each of which may serve upwards of 10,000 customers, in order to restore large blocks of customers as the early as possible manner. Then we attend to branch lines and finally to individual service leads. This means that some isolated customers in outlying areas are among the last to get service. (Priority is given to hospitals, water pumping plants, sewage disposal plants and other essential public services). When service to all of our customers has been restored, we patrol the street lighting circuits, which carry up to 10,000 volts. Obviously, it would be hazardous to attempt to put street lighting circuits back until all other circuits have been restored.

In their efforts to restore service as promptly as possible, our personnel worked Saturday and Sunday. Emergency crews who make conditions safe on the System work around the clock; construction crews who restore service work from dawn to dark.

All our forces were ably assisted by local municipal employees, policemen, firemen, Civil Defense volunteers, public works department personnel and others, who rendered invaluable cooperation in removing fallen trees, setting up protective barricades, directing traffic, etc. During the emergency we also received excellent cooperation from the local press and radio in the dissemination of important information to the public. We wish to take this opportunity of thanking all of them for their assistance.

TREES DO MOST DAMAGE

Westchester's beautiful shade trees have been famous for years. Yet, ironically, as in previous storms, it was trees which caused most of the interruptions. Because of the heavy rainfall which preceded and accompanied Connie, the ground around the base of trees became very soft and numerous trees were uprooted by the gale winds. In addition, the large branches of trees which fell across our lines were water logged and unusually heavy. Even after the strong winds subsided, many lines fell.

During a storm like Connie, when so many customers were deprived of electric service in a comparatively short time, the natural tendency is to pick up the telephone and call Con Edison. As we've said, this is only natural, but actually it doesn't help matters much! In fact, it isn't necessary for every customer to call us, because we already are aware of the situation. Instruments in our substations tell us when a breaker has been knocked out. Police notify us of lines that are down, and our employees on patrol duty let us know where there is trouble. It isn't long after a storm strikes that a pattern is established which indicates the locations and extent of the damage.

While our telephone facilities during such emergencies have been increased tenfold beyond normal peak requirements, it is largely impossible, however, to handle the enormous number of calls which our customers attempt to put through. Frankly, the telephone facilities, taxed as they are, cannot take care of the thousands upon thousands of calls made by customers trying to reach the Company at the same time.

WHAT WE ARE DOING

What is Con Edison doing to keep down the number of service interruptions during storms and hurricanes?

Last year, for instance, we launched a $20 million construction program designed to accomplish two objectives: (1) to meet the ever-increasing demands for electric power in Westchester and (2) to improve the continuity and dependability of our service.

It called for an additional transmission line between Yonkers and Millwood, a distance of about 20 miles, the construction of bulk power substations in Yonkers, Mount Vernon, White Plains and Pleasantville, or supplement existing facilities, and the erection of a number of new area substations at various "load centers" in the County.

Since the program was announced, substantial progress has been made. The White Plains and the Pleasantville substations are in operation as well as the new Eastview Service Center. We are continually increasing the replacement of open wire distribution lines with self-supporting aerial cable in heavily treed areas. This new type of heavy duty cable is much more rugged than the open wire and has proved to be very effective in preventing breaks.

•

WE ARE GRATEFUL

After Connie we received many comments from customers. True, some were not complimentary and we can understand why . . . we realize what it means to be without electricity! Most comments, however, were favorable, expressing appreciation of what was accomplished and how the job was done. We are grateful for all this and thankful that the storm's damage wasn't worse.

We join with you in the hope that the Hurricane Season for 1955 has passed. Should another emergency arise, however, we shall again be on the job doing everything humanly possible to serve you.

SERVICE INTERRUPTIONS IN WESTCHESTER COUNTY	HURRICANE "CONNIE" AUG. 13, 1955	HURRICANE "HAZEL" OCT. 15, 1954	ICE STORM "SILVER FREEZE" JAN. 9, 1953
No. of customers affected	59,719	57,540	40,610
Maximum number of customers out of service at one time	32,500	35,500	12,500
Sections of wire down	1,787	1,938	1,600
Poles down	50	53	25
Service leads down	383	1,207	1,250
Time required to restore service to all customers	2 days	3 days	5 days

Con Edison

PP&L Mails Flood Story to Staff, Stockholders

Pennsylvania Power & Light Co has issued an interesting folder of pictures on the recent flood damage in its territory as part of its follow-up program on the emergency.

PP&L's Advertising and Publicity Manager Bill Rogers, Jr, says the folder has been sent to all company employees at their homes because it "helped illustrate and personalize the problems that faced their fellow-workers . . . in such a crisis. With such material, great emphasis is always placed on the idea of 'show it to your friends and neighbors and talk it over.'" A digest version is being sent to the company's 89,000 shareowners.

Another feature of the company's follow-up program was a letter of thanks from Pres Charles E. Oakes to each firm and person who in any way assisted the company to restore service during the flood.

the P&K story

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WASHINGTON COMMENT

Sen O'Mahoney Trains Guns on Ebasco

Here is another congressional probe aimed at the industry and staged for big publicity play. Leaders must be on alert to rebut testimony attacking them

While other public power-minded Congressional committees nip at the Administration's heels, the Senate Judiciary subcommittee headed by Sen Joseph C. O'Mahoney (D-Wyo.) is digging into an aspect of the utility business which could bring repercussions.

O'Mahoney's guns are trained on the proposed merger of Washington Water Power Co and Puget Sound Power & Light Co. He would like to show that such a utility merger tends to create a restrictive monopoly, that it results in unfair treatment for the customers served by both firms.

He wants to go farther than that. O'Mahoney is mulling over the role of Ebasco Services, Inc, in the linkup. He's subpoenaed the records of this engineering and management firm and called in for questioning its president, Frederick C. Gardner, as well as other company officials.

Seeks Proof of Bond & Share Control

Here is what the Democratic senator would like to prove: That Ebasco, an offshoot of the Electric Bond & Share Co, still maintains control over a multitude of operating utilities through strategic placement of engineering and management personnel. Electric Bond & Share was disbanded as a holding company under the requirements of the Public Utility Holding Company Act of 1935 and subsequent court decisions. It now controls no domestic utility companies through stock ownership. O'Mahoney wants to gather enough evidence to indicate that control has been passed down in other ways through Ebasco.

He can't do this, of course. Some utilities managements may pay a great deal of attention to the professional services rendered by Ebasco, as it is Ebasco's business to be expert in this field. But leaning heavily for advice on outside help, no matter how high in the organization are the officials who do so, does not constitute control of the company by those consultants. There's no legal way in which the consultants can make their advice stick.

O'Mahoney has some legislative reforms in mind. He admits that he is not trying to show that Ebasco or Electric Bond & Share has done anything illegal. But he is trying to show "there has been some shaving" of the letter of the law and wants to curtail the activities of consultants. It's exceedingly doubtful that much, if any, revision of the holding company act will be considered next year, unless some unexpected development comes out of the hearings.

O'Mahoney's Publicity Must Be Counterattacked

But O'Mahoney may possibly stir up a fuss in this pre-election year. He may draw damning personnel charts leading from No. 2 Rector St, Ebasco's New York headquarters, to its field installations, attempting to show there's a web-like guidance exerted from New York on many of the nation's biggest utilities.

The damage these tactics can do depends to a great extent on press coverage. O'Mahoney is an old timer in dealing with Capitol Hill reporters. His subject, coming on the heels of Dixon-Yates and Hells Canyon and at a time when little else is doing in Washington, is dramatic. Reporters can't be expected to ask too many questions when an exciting, though exaggerated, power story with national political implications is handed to them on a silver platter under such conditions.

The extent of damage to the utility industry's name also depends on the utilities themselves. They should realize that it is not only Ebasco under attack but the business-managed electric utility industry as a whole. If the industry plays an active role in promptly rebutting the anticipated allegations, utility executives can offset a lot of the propaganda expected to come out of O'Mahoney's "Court." They can use other means at their disposal to offset O'Mahoney's charges. The most effective method is free speech among members of the business community.

TECHNICAL NOTES

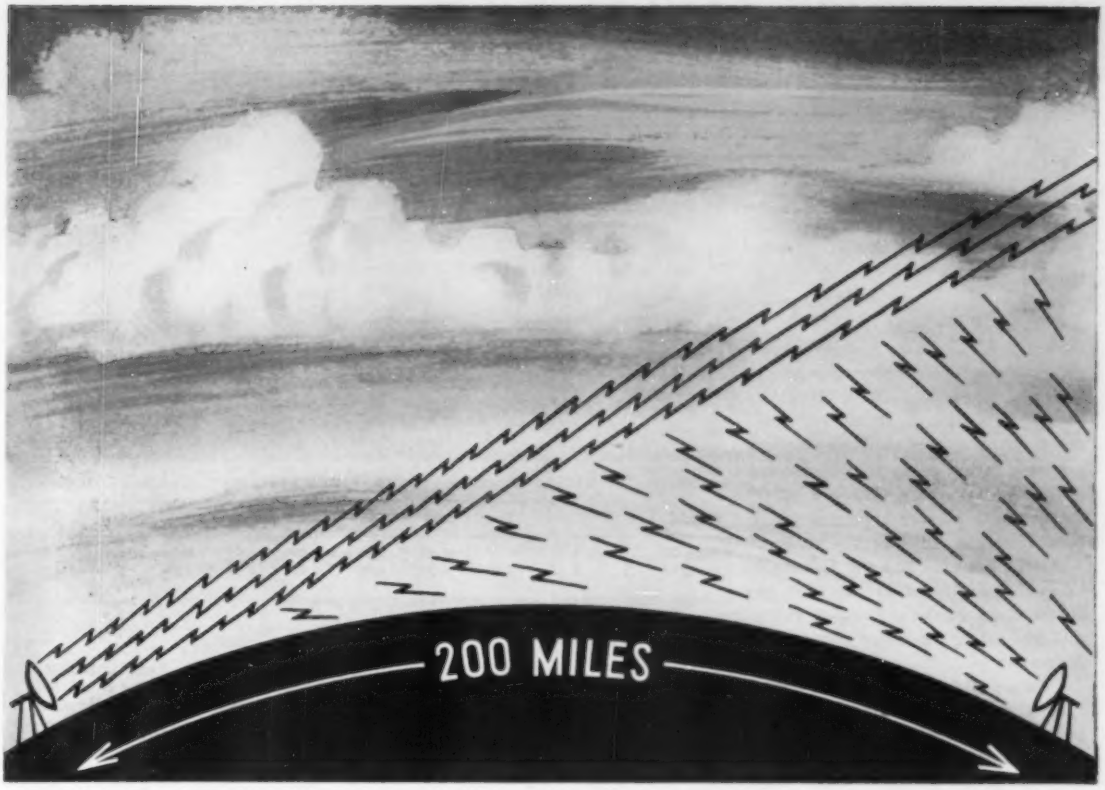
Washing sulfur dioxide from flue gases costs the British Electricity Authority from 8 to 10 shillings per ton. Tall stacks achieve the requisite dilution at lower cost.

Static eliminators of radioactive nature usually are short-range, easily absorbed alpha radiation from either radium or polonium.

Dry-season flow of Congo River at Inga Rapids 100 miles inland is estimated capable of producing 50 million kw. Initial development of 20 million kw has been proposed at a cost between $500 million and $1,500 million.

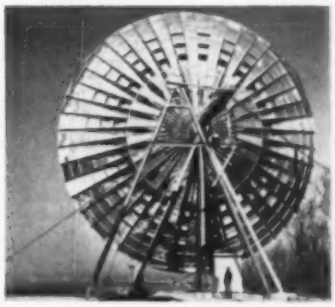
Transistors and crystal diodes, already famous for their communications applications, have now teamed up to regulate dc power rectified from an ac source. Other circuitry could make these simple semi-conductors the heart of a static control system for feeder voltage regulators.

Fresh water comes from the ocean for a West Coast steam station. Sea-water evaporators improve its purity to 50 ppm, after which boiler-feed evaporators refine it to better than 1 ppm. Boiler-feed evaporators are heated by extraction steam which subsequently exhausts through the sea-water evaporators.



Highly schematic drawing illustrates the possible distribution of energy in ultra-high-frequency "over-the-horizon" transmission. The effect is similar to that of a powerful searchlight whose beam points into the sky. Light can be seen miles away from behind a hill even when the searchlight lens is invisible.

Something new on the telephone horizon



This experimental 60-foot antenna (rear view) photographed at Bell Laboratories in Holmdel, New Jersey, is designed for study of "over-the-horizon" phenomena.

Telephone conversations and television pictures can now travel by ultra-high-frequency radio waves far beyond the horizon. This was recently demonstrated by Bell Telephone Laboratories and Massachusetts Institute of Technology scientists using "over-the-horizon" wave propagation, an important recent development in the radio transmission field.

This technique makes possible 200-mile spans between stations, instead of the 30-mile spans used for present line-of-sight transmission. It opens the way to ultra-high frequencies across water or over rugged terrain, where relay stations would be difficult to build.

In standard microwave line-of-sight transmission, stations are so spaced that the main beam can be used. But now, with huge 60-foot antennas, and much higher power, some signals drop off this main beam as it shoots off into space. These signals reach distant points beyond the horizon after reflection or scattering by the atmosphere. The greater power and larger antennas of the "over-the-horizon" system permit recapture of some of these signals and make them useful carriers. The system will be a valuable supplement to existing radio relay links.

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CP&L Lends $50,000 To Promote State

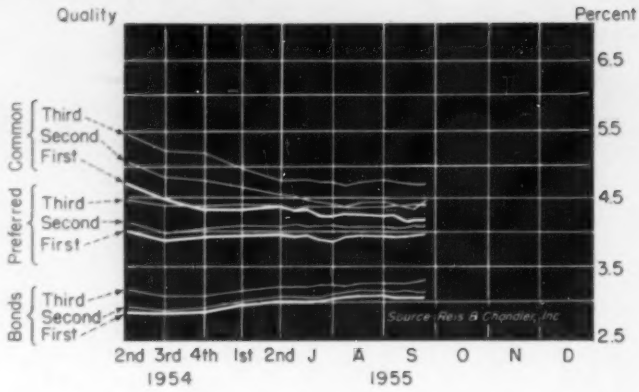
Directors of Carolina Power & Light Co have subscribed to $50,000 of stock in the Business Development Corporation of North Carolina, which was recently chartered to promote Gov Luther H. Hodges' Small Industries Plan.

The Governor said that CP&L Pres Louis V. Sutton, commented in advising him of the board's action, "We are glad to share in this vital venture. Our business is to build the territory we serve and to increase its prosperity. Your aims are consistent with the industrial and agricultural development efforts to which a full-time department of our company has devoted its energy for years. We are proud to become a part of a project which should benefit all North Carolina."

As for himself, said the Governor, he is "very pleased to see such enlightened companies as Carolina Power & Light taking an active part in this program.

"We are all familiar with the CP&L Finer Carolina program and its efforts in encouraging community development through voluntary and cooperative projects," Hodges said. "This subscription in the Business Development Corporation is another indication of the public-spirited attitude of this company."

Today's Utility Yields (%)



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Sept. 22	3.12	3.17	3.33	3.98	4.10	4.39	4.19	4.45	4.70
Sept. 15	3.12	3.17	3.30	3.97	4.12	4.39	4.19	4.36	4.70

Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Carolina Power & Light	12	Aug.	$8,710,434	$7,776,898	$	$
Detroit Edison	12	Aug.	25,242,363	21,147,546	2.34(a)	1.97(a)
Houston Lighting & Power	12	Aug.	13,900,958	12,018,365	2.31(b)	2.20(b)
Ohio Edison and subsidiary	12	Aug.	22,408,176	19,797,281	3.39(a)	2.94(a)
Oklahoma Gas & Electric	12	Aug.	7,935,309	6,279,028	2.20(c)	1.96(c)
Southern Co. consolidated	12	Aug.	24,968,210	22,812,528	1.38	1.26

Notes—(a) Based on average number of shares outstanding; (b) Based on shares outstanding at close of respective periods, and (c) Based on 2,984,783 shares in 1955 and 2,653,140 shares in 1954.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
SEPTEMBER 21—27			
PREFERRED STOCK			
Public Service Electric & Gas—250,000 sh 4.30% cum $100 par	$25,438	$101.75	4.23%
COMMON STOCK			
Tampa Electric—197,532 sh (being offered commonholders on 1-for-10 basis, record Sept. 19 to expire Oct. 6)	$5,037	$25.50	3.92%
SCHEDULE FOR OCTOBER			
BONDS AND DEBENTURES			BID DATE
Pacific Power & Light—1st mtg due 1985	$10,000		Oct. 4
Public Service Electric & Gas—debs due 1975	35,000		Oct. 4
Worcester County Electric—1st mtg due 1985	8,500		Oct. 18
New York State Electric & Gas—1st mtg due 1985	15,000		Oct. 19
Long Island Lighting—1st mtg due 1985	15,000		Oct. 26
PREFERRED STOCK			
Pacific Power & Light—30,000 sh $100 par	$3,000		Oct. 5
COMMON STOCK			
Louisville Gas & Electric—160,000 sh (to be offered commonholders on 1-for-10 basis, record about Oct. 13)			
Indianapolis Power & Light—209,685 sh (to be offered commonholders on 1-for-15 basis, record about Oct. 27 to expire Nov. 10)			
Southern Co—1,507,303 sh (to be offered commonholders on 1-for-12 basis, record about Nov. 1 to expire Nov. 22)			

FINANCIAL BRIEFS

Illinois Power Co will pay Nov. 1 a quarterly common stock dividend of 65¢ a share as compared with 55¢ a share in the previous quarter.

Florida Railroad & Public Utilities Commission has authorized **Florida Power & Light Co** to sell privately 50,000 shares of 4.35% preferred stock at $100 a share. Sale is being negotiated for the utility by Merrill Lynch, Pierce, Fenner & Beane and Kidder, Peabody & Co.

Atlantic City Electric Co stockholders have approved a 3-for-2 common stock split . . . **Central Maine Power Co** is planning to offer this week 505,719 common shares to its common stockholders on 1-for-5 basis and to 6% preferred stockholders on share-for-share basis. Both offers will be made to holders of record Sept. 30.

STATISTICS

Generation in First 6 Months Jumps 13.9% over 1954 Period

For the 6 months ended June 30, 1955, the nation's utilities . . .

. . . generated 258,257,439,000 kwhr (13.9%, over first half '54)
199,867,382,000 kwhr by fuel plants (17.9%, more)
58,390,057,000 kwhr by hydro plants (2.1%, more)

and imported 1,963,469,000 kwhr.

Subtracting 5,657,607,000 kwhr in energy used by producer,
760,162,000 kwhr in company use, and
24,462,588,000 kwhr in energy lost and unaccounted for leaves . . .

a TOTAL of 229,340,551,000 kwhr in sales to ultimate customers (15.2%, higher)

Of the total sales, utilities sold . . .

60,503,823,000 kwhr to residential customers (10.8%, more)
4,688,416,000 kwhr to rural customers (6.5%, more)
38,015,501,000 kwhr to commercial customers (9.4%, more)
116,407,991,000 kwhr to industrial customers (21.2%, more)

2,112,504,000 kwhr went to street & highway lighting customers (8.0%, more)
4,960,288,000 kwhr went to other public authorities (7.5%, more)
1,319,480,000 kwhr went to street and interurban railways (4.7%, less)
1,041,046,000 kwhr to electrified railroads (2.7%, less)
291,502,000 kwhr for interdepartmental users (6.3%, more)

Source: Edison Electric Institute

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	July	108.79	107.62	96.98	12.2
Peak—Class I Systems (million kw)	July	89.3	86.6	78.2	14.2
Estimated Dec. '55 Peak	July	96.3	96.6	96.1	0.2
Production—billion kwhr	July	46.63	44.23	40.12	16.2
Hydro		9.35	9.71	8.75	6.8
Fuel		37.28	34.53	31.38	18.8
Sales—billion kwhr	July	40.89	40.17	35.01	16.8
Residential		9.89	9.57	9.11	8.5
Commercial		6.92	6.48	6.40	8.0
Industrial		21.50	21.75	16.97	26.7
Other		2.59	2.38	2.51	2.9
Fuel Consumption	July				
Coal—million tons		11.72	11.07	9.41	24.5
Oil—million barrels		4.62	4.69	4.44	3.9
Gas—billion cu ft		126.25	107.42	128.30	−1.6
Net Income Class A & B Co's—$ million	July	89.87	96.75	83.84	7.2
Residential Customers—millions	12 mos.	43.74	43.64	42.48	3.0
Revenue per kwhr	ended	2.67¢	2.67¢	2.71¢	−1.5
Avg kwhr per customer	June	2,649	2,637	2,442	8.5
Avg annual bill		$70.73	$70.41	$66.18	6.9

Business Statistics . . .

Indexes: 1947-49 = 100					
FRB Industrial Production	Aug.	140	131	123	13.8
ENR Construction Cost	Aug.	141.0	138.4	134.6	4.8
BLS Cost-of-living	Aug.	114.5	114.7	115.0	−0.4
NEMA Sales	June				
Insulation materials		158	154	124	27.4
Electric appliances		122	110	102	19.6
Household refrigerators		105	104	82	28.0
Wholesale prices	Aug.				
Motors and generators		121.5	121.5	123.1	−1.3
Transformers and regulators		127.3	127.3	128.1	−0.6
Switchgear and fuses		139.2	135.5	135.1	3.0
GNP—annual rate—$ billion	2nd Qtr.	$385.0	$375.3	$357.6	7.1

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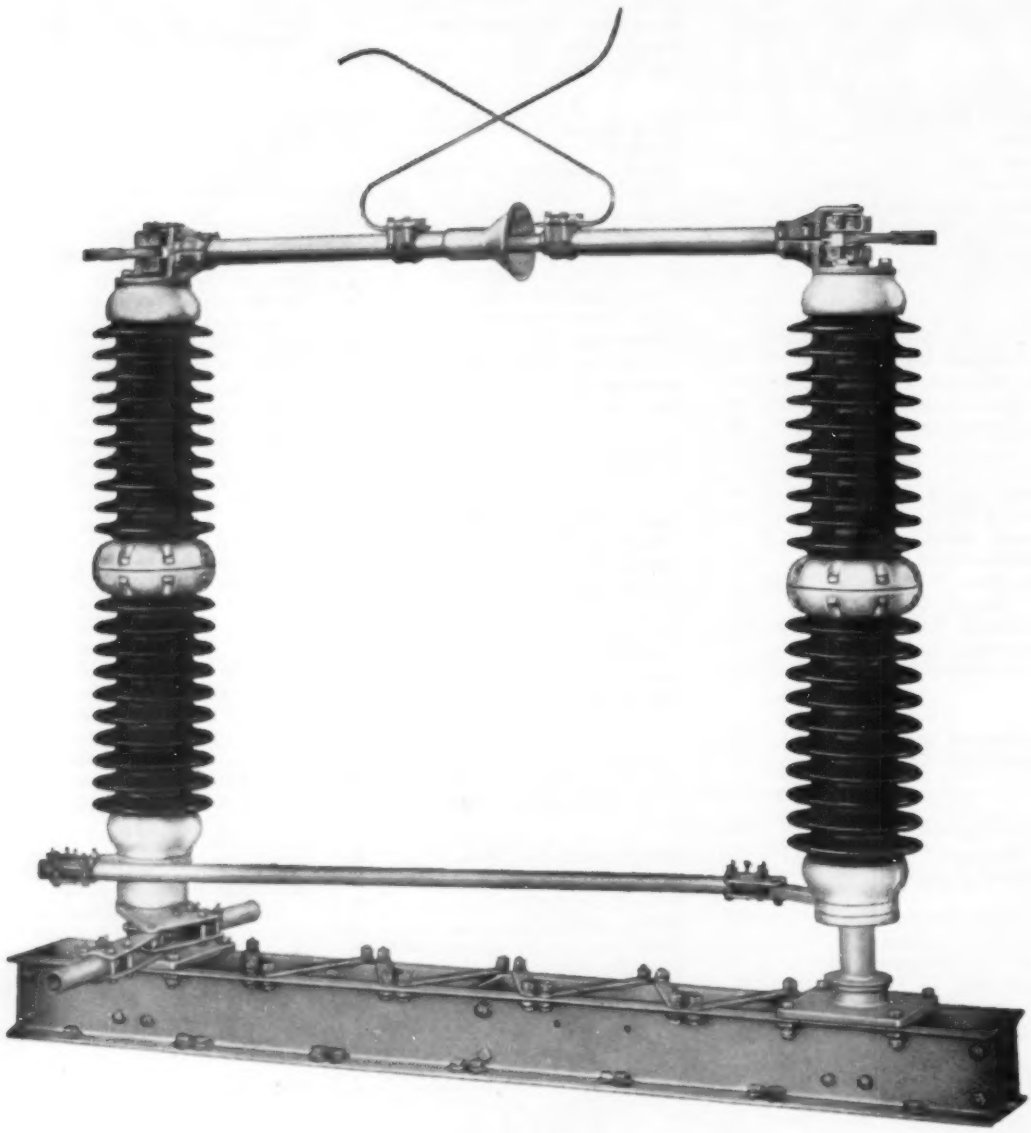

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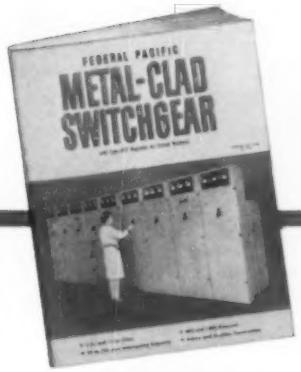

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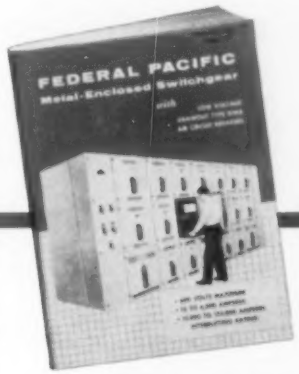

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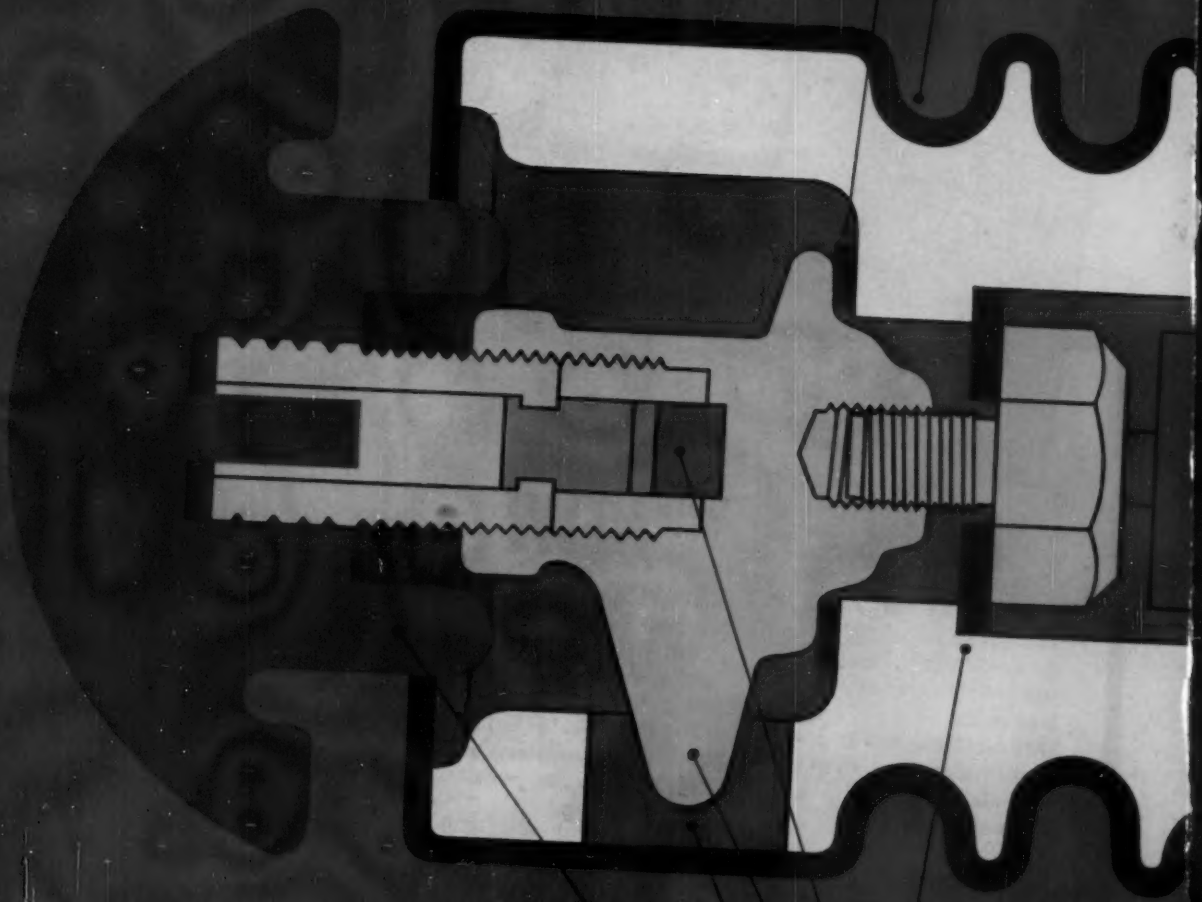
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